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THE EFFICIENCY OF THE OXYGEN-CARBON DIOXIDE TREATMENT OF CARBON MONOXIDE POISONING*

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IN AUGUST, 1923, the Commission of the American Gas Association[1] for the investigation of carbon monoxide poisoning published a final report which contained three principal recommendations regarding treatment: (1) that the use of positive pressure ventilation apparatus such as the pulmotor and lungmotor be discontinued; (2) that the use of the prone pressure method of artificial respiration be broadened and encouraged in every manner possible; (3) that cases be treated by means of an inhalation of 95 per cent. of oxygen and 5 per cent. of carbon dioxide given by special apparatus. Three appliances for this purpose were examined by the Commission and passed as satisfactory. These devices are the H-H Inhalator, manufactured by the Mine Safety Appliances Company, 908–912 Chamber of Commerce Building, Pittsburgh, Pa.; the Industro Oxygenator

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[1] The Commission was composed as follows:

Dr. Walter B. Cannon, Professor of Physiology, Medical School of Harvard University.

Dr. David L. Edsall, Dean, Medical School of Harvard University, and Professor of Clinical Medicine, Medical School of Harvard University.

Dr. Howard W. Haggard, Instructor in Applied Physiology, Yale University; Consulting Physiologist to the United States Bureau of Mines.

Dr. Lawrence J. Henderson, Professor of Biological Chemistry, Medical School of Harvard University.

Dr. Yandell Henderson, Professor of Applied Physiology, Yale University; Consulting Physiologist to the United States Bureau of Mines.

Dr. Francis W. Peabody, Professor of Medicine, Medical School of Harvard University.

Dr. Royd R. Sayers, Chief Surgeon, United States Bureau of Mines; Surgeon, United States Public Health Service.

Mr. Charles B. Scott, Accident Prevention Committee, American Gas Association.

Dr. Cecil K. Drinker, Chairman, Professor of Physiology, Harvard School of Public Health.

Universal Model, manufactured by the Protecto Safety Appliance Company, 69 Warren Street, Newark, N. J.; and the Atmos Inhalator, Model C, manufactured by the American Atmos Corporation, 105 West 40th Street, New York City. The novel feature of these recommendations is the final one, and the present report is an effort to evaluate the accomplishments of the oxygen-carbon dioxide treatment. This treatment was devised by Dr. Henderson and Dr. Haggard of Yale University. Recognizing the fact that for every physiologic reason the immediate necessity in gas poisoning is a free flow of oxygen into the pulmonary alveoli, these investigators mixed oxygen with 5 per cent. of carbon dioxide, thus utilizing the stimulating effect of carbon dioxide on breathing in order to get a high concentration of oxygen in the lungs.

A word here on the general question of the use of apparatus in the emergencies of resuscitation is pertinent. Objections to apparatus have been of two sorts:

1. The devices marketed for such use, notably the pulmotor and lungmotor, are not consistently reliable for delivering air or gas mixtures to unconscious moribund individuals. This objection is based on careful medical examination of available appliances. It constitutes a scientific denial of the uniform efficiency of apparatus blowing air or air mixed with oxygen into the lungs of patients through a face mask placed over the mouth and nose and withdrawing waste gases through the same route. The inhalation method of resuscitation depends on stimulating the patient's natural breathing. It merely offers the patient 95 per cent. of oxygen which he is caused to breathe three to five times as vigorously as normally because of the addition of 5 per cent. of carbon dioxide. When this method of treatment was first recommended two years ago there was no reason to believe it would not be perfectly safe and effective in nonmedical hands and all the data available confirm this.

2. Field workers on resuscitation object to all forms of apparatus on the ground that mechanical appliances are never on hand when needed and that they tend to get out of order. The argument of unavailability is particularly important in connection with electric shock. Shocked persons whose hearts are still beating but who have stopped breathing have about ten minutes to live unless given artificial respiration at once. It is consequently wise to advocate prone pressure artificial respiration as the preeminently important reliance in such accidents. Gas poisoning is different. Every source of evidence shows that the vast majority of gassed persons are breathing when found and the condition from which they are suffering is remedied specifically by oxygen. Oxygen cannot be given without apparatus and it can be given more efficiently if the apparatus is designed to offer 5 per cent. of carbon dioxide at the same time. Carbon monoxide poisoning thus presents a specific need for apparatus which cannot be denied and which makes it necessary to recommend that, while all persons who may come in contact with cases of gas poisoning be trained in artificial respiration, it be made possi-

ble to use inhalation apparatus at the earliest possible moment. In regard to the mechanical ruggedness of the appliances recommended by the Commission, little need be said. No complaints of breakdown have been received. If adequately inspected, the inhalers are reliable. Their use has presented only one point of difficulty, namely, the securing of an adequate supply of oxygen-carbon dioxide cylinders. In several instances gas companies have solved this trouble by filling the empty cylinders themselves. Commercial oxygen and carbon dioxide are quite safe for this, and where use is large a degree of independence and safety of supply is assured which is most advantageous. The companies selling approved inhalation apparatus have made every effort to provide a reliable supply of the standard mixture and the present difficulty does not seem much greater than that involved in any delivery requiring railroad shipment. It exists, however, and should be considered when inhalation apparatus is installed in isolated sections.

Sources of Data on the New Treatment

The crucial points involved in a consideration of the efficiency of the new treatment are apparently the following: (1) Are the unpleasant effects of minor degrees of gassing caused to disappear more rapidly if the oxygen-carbon dioxide inhalation is used? Should this be the case, the treatment must be of value wherever it is important to shorten disability and to reduce the familiar, minor, unpleasant after effects of carbon monoxide poisoning. (2) Has the inhalation treatment proved effective in bringing about the rapid recovery of seriously gassed patients? (3) Has it proved practically possible, in the rare and most serious cases of gassing where breathing has ceased, to use the inhalation treatment in combination with prone pressure artificial respiration, stopping the artificial respiration as natural breathing becomes established?

In order to obtain data relating to these points, I have secured from the three manufacturers of inhalation apparatus the names of firms and organizations to whom they have made sales. At the present time, 300 firms possess inhalation apparatus. A vast majority of these have bought the H-H Inhalator, but there are enough of the other two types in use to convince me of their entire efficiency; and beyond the fact that one of the three approved devices has had a numerically larger field test, there is no evidence leading to the recommendation of a single machine to the exclusion of the others. The exact number of inhalers in use is of course much in excess of 300, since many firms require a fair number in order to meet their needs. The exact total is, however, of little importance. It is evident that distribution has been wide and that there has been a good opportunity to try the new treatment in the field. All the purchasers of inhalation apparatus have received the following letter:

Several years ago I was made chairman of a commission instituted by the American Gas Association to examine methods of resuscitation in gas poisoning. As one of the most important achievements of this commission, Doctors Henderson and Haggard devised the inhalation method of

treatment. This treatment became available two years ago and it now seems appropriate to make an inquiry in order to discover how efficient it has been. I have, therefore, secured from manufacturers a list of purchasers of inhalation apparatus and am consequently writing to you since the name of your firm (or hospital) appears on this list.

Will you be good enough to give me your opinion of the efficiency of the inhaler together with any actual data you may have collected as to its achievements? It is exceedingly essential in evaluating any measures in regard to resuscitation to know the condition of the patient when resuscitative measures were applied and the most important element in reporting this condition is the breathing. Do your records contain anything in regard to this? And is it possible in the future to see to it that they do? No description is required other than the rate of breathing and some comment on the depth. Rescue crews are so well organized and composed of such intelligent men that it has proved easily possible to obtain these data if the crews in question are aware of its importance.

Will you be good enough to give me any information possible and wherever circumstances permit, will you include a note upon the breathing in all future reports upon cases that come to treatment with inhalation apparatus?

Where replies to this letter were not received the inquiry was repeated and in many instances third letters dealing with specific points have been sent. In tabular form the data obtained are as follows:

Total purchasers	300
Total replies	180
Number reporting actual field use of apparatus	86
Total number of cases reported with sufficient detail to be included in this report[2]	110

[2] In many instances firms have reported successful treatment of "several cases of gassing" and have been unable to supply details. It is certain that the total number of asphyxiated persons whose experiences are reflected in this report is not less than 150, but the author has confined his actual discussion to those cases presented with some thoroughness.

No replies unfavorable to the inhalation treatment have been received. In several instances questions have been asked as to the propriety of using the lungmotor or the pulmotor with the inhalation treatment. These specific questions will be discussed later in this report. They have involved special points and have not dealt with the broad and more important matter of actually discarding the inhalation method and returning to former appliances. *There is absolute unanimity of feeling, wherever the method has been tried, that it represents a decided advance upon former practices.*

In a few cases the replies have come from physicians. Most of them are the direct reports of nonmedical rescue men. It would of course be ideal if data on this subject could be supplied by physicians with special experience in carbon monoxide physiology. This is quite impossible. The great majority of gassed cases in this country are attempted or successful suicides. They are usually seen first of all by the police, and most frequently receive their first systematic treatment from the emergency crews of the gas companies. Owing to the facts that resuscitation from gas poisoning is badly taught or entirely neglected in most medical schools, the young ambulance surgeons who reach the scene next have little effect on the outcome.

Several years ago the author and Dr. Cannon made an effort to get some information on gas poisoning from hospital records in Boston, New York,

and Philadelphia. In grosser aspects this effort was successful, but as an inquiry into the details of a common disease it failed because in most instances details were not given. At the present time it is impossible to get information on the condition of gassed patients at the time resuscitation measures are applied from properly qualified medical men except in rare instances. The accomplishments of resuscitation cannot be evaluated without this early observation and it does not need to include very much. Consciousness, or unconsciousness, the general appearance of the patient, and above all the rate and character of the breathing give the information most needed. Experienced rescue men note these points and all rescue men should be taught to observe them. Reports on gassed cases ought to contain the following items:[3]

1. Condition prior to asphyxiation (drunk, previous illness, etc.).
2. Time elapsed before discovery.
3. Time last seen or heard.
4. Condition when discovered:
   - Conscious; unconscious.
   - Breathing—rate per minute.
     - General character:
       - Gasping and slow.
       - Shallow.
       - Rapid and weak.
       - Increased.
   - Pulse—rate per minute.
   - General appearance of patient.
5. Resuscitation methods used:
   - Length of time of application of inhalation treatment.
6. Condition at end of inhalation:
   - Breathing.
   - Pulse.
   - General.
7. Condition next day.

[3] The items suggested need not make a separate report but can be included in the general report form covering gas accidents.

Rescue men in the gas companies, together with policemen and firemen, should receive instruction in noting these points. The author has had a personal opportunity in the case of one large gas company to experiment with instruction of this kind and believes it has "taken" well. Certainly the enhanced interest of the men, a natural consequence of knowing more about what they are combating, is most advantageous in securing high grade rescue work.

There is an apparent contradiction in contending that emergency men make reports of sufficient value for use and in then supplementing this with a suggestion for systematic instruction in obtaining certain items of medical information. There is, however, no line of effort involving large groups of men in which training will not bring improvement and the evidence which follows constitutes the best argument for the author's view that the present nonmedical sources of data are a convincing endorsement of the inhalation treatment.

Evidence

I. On the Value of the Oxygen-Carbon Dioxide Treatment of Mild Gassing

1. In reply to your letter of March 27, in regard to our H-H Inhalator, would say that so far we have not had occasion to use it on any serious case of asphyxiation. We have used it on some of our men who have been somewhat overcome while working in the purifying house. The response was immediate, and in each case the employee came through his experience without the severe headache which usually goes with this sort of difficulty. (Salem Gas Light Company, Salem, Mass.)

2. There is an immense amount of satisfaction in the fact that you can now

TABLE 1.—SUMMARY OF ADDITIONAL CASES OF MILD GASSING TREATED BY OXYGEN-CARBON DIOXIDE INHALATION

NAME OF COMPANY	AGE OF PATIENT	SOURCE OF POISON	TIME OF EXPOSURE	TIME BEFORE INHALATION	CONDITION BEFORE INHALATION	PULSE	BREATHING	TIME OF INHALATION	CONDITION AFTER INHALATION	CONDITION NEXT DAY
			hr.–min.	*hr.–min.*				*hr.–min.*		
St. Paul Gas Light Co.	27	gas main	0–15	0–10	severe headache	...	normal	0–20	no headache	good
	38	leaking gas main	....	0–10	headache	...	normal	0–10	no headache	no effect
	26	leaking gas main	1–15	1–0	severe headache	...	..	0–7	good; dull feeling	very good
	..	leaking gas main	1–30	2–0	headache	...	..	0–15	almost normal	.....
	28	broken gas main	2–0	0–25	severe headache	...	..	0–15	normal	very good
Chicago By-Product Co.	48	gas plant	0–45	0–20	weak	slow	weak	0–15	fair; pulse stronger, breathing good	little headache
	..	gas plant	0–5	0–15	hazy headache	...	..	....	headache much improved	.....
	41	gas plant	0–10	0–15	headache	...	..	....	no headache	good results
	Six men working in gas plant.		....	....		...	..	....	....	good results
The Peoples Gas Light & Coke Co	42	leaking pipe	....	short time	dazed	weak and thready	shallow	0–15 to 20	breathing and pulse improved	good

		0–25	good; pulse 103, breathing 20	.....				
		0–25	very good	.....				
		0–15	fair	good				
		0–20	very good	.....				
		0–45	much improved	good				
		0–45	much improved	good				
		0–15	normal	good				
		0–2			0–10	conscious	118	12
		....			0–35	conscious; poor	40	6
		....			0–25	conscious; poor	fast	10
		0–35			0–35	conscious; poor	40	10
		0–20			0–45	conscious; poor	40	8
		0–20			0–45	poor	40	10
		0–30			0–10	fair; dizzy	80	12
Wierton Steel Co.	22	5	leaking pipe					
		50	open gas tube					
Boston Consolidated Gas Co...		1½	pilot light out					
		22	open gas jet					
		23	auto fumes					
		60	auto fumes					
			gas tube					

take a man that is gassed to the point of unconsciousness and at the expiration of twenty-five minutes' use of the inhaler, send this man out, smoking his pipe and feeling as well as when he came to work—not even a headache. The above happened some time ago with our employee, Mr. F. H. He had been clinking on the producer—Koppers Kerpely type—and had been working about four hours before showing any bad signs. As soon as it was noticed that he was ill, he was carried to the office. By this time—probably two minutes had elapsed, and the patient was groaning and as far as we could tell, was unconscious. The inhaler was applied and sufficient carbon dioxide-oxygen gas supplied to hold a light pressure of ten liters on the bag, making sure that the patient was getting no outside air. His breathing rate at this time was 45 and the pulse 87. Within possibly two minutes, he was taking 15 liters but—how he did breathe! He fairly groaned and when asked if he felt better, he answered that he did. At the end of 25 minutes, he got up, lighted his pipe and was put to work on a different job, and worked the rest of the day feeling fine, having no headache and no lost time.

Inasmuch as you have the report of the cases of H. H. and F. M., we will next take up the case of W. B. W. I am sorry to say I was not at the Plant when this case started so did not get the pulse and breathing rate. I did arrive after the first bottle of carbon dioxide-oxygen gas was used. This man was attempting to fix some small CO gas leaks on the feed valve levers of the producer. He was getting a little gas now and then, and worked through until the lunch hour, feeling somewhat the effects of the gas. He went to a boarding house close by the plant and ate a warm dinner and at 12:30 went back to his work. At 1:30 he managed to walk to the Shop, a distance of 300 feet where he laid on the floor, becoming all but unconscious. At this time the inhaler was applied, one bottle of the carbon dioxide-oxygen gas being used. He was helped to the door where he vomited. He again laid down and from all appearances and actions of the patient, we thought he would faint. However, two more bottles were used which brought him around in fine shape except for a bad headache, from

which cause he went home at 3:30 P.M. He was back at work the next day, feeling as well as ever, according to his own report. (Battle Creek Gas Company, Battle Creek, Mich.)

3. Thus far, we have administered the combination to many minor cases but have been fortunate enough to avoid having any cases of complete asphyxiation.

In such cases as just mentioned, reports from all stations agree that cases which formerly had symptoms justifying their being sent home for a day or two, now are given a few minutes treatment by inhalation and go back to work apparently none the worse. (Philadelphia Company, Pittsburgh, Pa.)

4. The Emergency Crews were instructed to rely wholly upon the Schafer prone pressure method of resuscitation, plus the H-H Inhalator which we purchased from one of the companies whose product was approved by the Commission on Resuscitation. In order to insure utter reliance upon the Schafer method in conjunction with the inhalator, the lungmotor equipment was not available. Under this practice our crews continued to resuscitate victims of carbon monoxide poisoning, and it was noticeable that the victims of this poisoning recovered more rapidly than under the former method and the severity of the after effects of the poison was appreciably lessened. (Detroit City Gas Co., Detroit, Mich.)

5. Herewith is a card on the first real gas case in which we used your inhalator.

This man was working about the bosh of a blast furnace on last Saturday, which was a day of rain and heavy atmosphere. One of the foremen saw him start to fall and caught him in his arms and ran with him to the rescue station. After using the inhalator about a minute, he started to revive and after about ten minutes of inhalation he went back to work and reported no ill effects.

We are naturally much pleased with the work of the machine and feel that it is going to be a great help. (This is the experience of a large steel company in the Pittsburgh District.)

6. Your letter concerning the H-H Inhalator has been referred to me for reply.

We have had this outfit for use in our Receiving Ward and Ambulance since about August 1924, regarding it as a very valuable measure of resuscitation, as it is used about once a week for gas poisoning cases.

It would be impossible to tabulate the number of cases at the present time with any extensive data, since we are extremely busy, but it is our impression that:

(1) Cases which are not breathing, respond fairly well to artificial respiration which can be stopped as soon as breathing reaches six to ten times a minute.

(2) That the depth of inspiration is more marked than the frequency of respiration with this procedure. (We understood that the rate of respiration would be increased almost double normal, but have not found that this is so.)

(3) In the frequent type of case, where the patient is not unconscious, we are able to relieve the headache and send the patient home.

In conclusion, I am sorry not to be able to give you more accurate information, as this has been regarded as a routine procedure and is no longer an expensive toy. (Presbyterian Hospital, Philadelphia, Pa.)

7. On the first man, we used the H-H Inhalator for about twenty minutes and it cleared him up so that in an hour he was perfectly normal and insisted that he go back on the job, which he did with no ill effects from the gas.

The second man was at the gas plant and had a very bad case. He had been working and inhaling gas from a bad leak for a long time and while he was not unconscious, he had taken a lot of gas. We worked on him for about thirty-five minutes and he cleared up splendidly, had no headache and said he felt as well as ever. However, we took him home and the next morning he was back on the job and informed the foreman that he felt no ill effects. (Public Service Company of Colorado, Denver, Colo.)

8. Fortunately we have had no occasion to use it in a severe case of gas poisoning since its purchase. The only use it was put to was in cases of headache caused by gas and we found it very effective for this. Our only criticism is that the gas container is too small and so empties too readily. However we are now supplied with Carbon

Dioxide tanks and can do our own refilling. (City of Holyoke, Mass., Gas and Electric Department.)

9. Most of the cases on which this apparatus has been used were among our laborers, however, none of them inhaled enough gas to cause them to lose consciousness. In practically every case, we found that by treating them with this apparatus they were able to continue their work with only slight discomfort. We are very well pleased with the workings of the apparatus. (Galveston Gas Company, Galveston, Texas.)

10. All the rest of our cases have been very light cases and this treatment has shown wonderful results with quick recovery. This is especially true in cases of men overcome with producer gas where the treatment restores them to normal health in a very short time leaving practically no ill effects whatever, the men not even complaining of headaches and going directly back to work. (Utica Gas and Electric Co., Utica, N. Y.)

This evidence on mild gassing is of especial importance to all gas manufacturers. It brings them assurance that the minor emergencies which occur from time to time even in the most modern surroundings can be reduced in significance by the use of a brief period of inhalation. No one can breathe the oxygen-carbon dioxide mixture without a decided increase in ventilation with oxygen, and the prompt removal of carbon monoxide lessens the annoying consequences of moderate gassing.

II. On the Value of the Oxygen-Carbon Dioxide Treatment of Serious Gassing, Breathing Being Still Present When Inhalation Was Begun

1. A man intoxicated with moonshine made an attempt at suicide by inhaling gas from a gas tube placed in his mouth. When he became unconscious, the tube fell from his mouth and he was later found and rushed to the hospital. According to Dr. X, who attended him, the man's breathing was very, very shallow. The inhalator was put on and in one minute and a half the man began to show signs of deeper breathing. The inhalator was then removed and the man at once relapsed into shallow breathing. The inhalator was replaced and at the end of seven minutes the man was taking very deep breaths. In this case respiration had never been fully suspended, but the rate was about 14 per minute. The Schaefer method of resuscitation had not been necessary. The man's pulse was of fair quality, due probably, according to Dr. X, to the stimulus of alcohol. Eye reflexes were present and there was no indication of nausea. Needless to say Dr. X was much pleased with the results of the inhalator. (Haverhill Gas Light Company, Haverhill, Mass.)

2. This accident occurred on January 17, 1924, at 24 Hunting Street, Cambridge. We understand that gas had been escaping probably from midnight on January 16th, until about 9:30 A.M. on the 17th. A tube was accidentally pulled off the gas jet and was only discovered after the boarder had gone to another house, one-half mile distant, and returned with a woman to take care of the children who were sick during the night. I understand some of these patients slept on the floor so probably did not get as much gas as they would have if they had been in bed. The father, son, and daughter were taken to the Cambridge Municipal Hospital and two apparatus, the H-H type, were obtained from the Gas Company and were used for a period of about four hours. The father evidently had been drinking and although unconscious, at the time I first saw him, revived within fifteen or twenty minutes and received no further treatment from the apparatus. The boy and girl were both unconscious and were given oxygen and carbon dioxide gas at intervals for a period of four hours. Very little hope was expressed in regard to the girl, but the boy became conscious during treatment and called for his father. After gas had been administered for probably two hours at intervals, the girl started to have violent convulsions and we decided to let them breathe the fumes of ammonia.

TABLE 2.—SUMMARY OF ADDITIONAL CASES OF SERIOUS GASSING TREATED BY OXYGEN-CARBON DIOXIDE INHALATION

NAME OF COMPANY	AGE OF PATIENT	SOURCE OF POISON	TIME OF EXPOSURE	TIME BEFORE INHALATION	CONDITION BEFORE INHALATION	PULSE	BREATHING	TIME OF INHALATION	CONDITION AFTER INHALATION	CONDITION NEXT DAY
			hr.-min.	*hr.-min.*				*hr.-min.*		
The Peoples Gas Light & Coke Co.....	55	open gas jets	....	....	unconscious; gasping	..	...	0–15	breathing deep; dazed	....
Fall River Police Dept.....	86	open gas cock	....	....	unconscious; breathing slight	..	...	2–0	unconscious; breathing natural	dead 9 hrs. after found
Coney Island, N. Y.....	50	.....	....	....	asphyxiated; breathing slight	..	...	0–5	revived; breathing more normal	.....
Rochester Gas & Electric Corp.....	55	.....	....	1–0	poor; pulse high, breathing shallow	..	...	0–30	good	.....
Central Hudson Gas & Electric Co.....	45	hot water heater	1–0	1–15	semiconscious	..	shallow	0–15	breathing practically normal; bad *headache*	good

J. I. H.
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New Haven Hospital.....	52	open gas jet	....	0–30	coma; very weak	90	8	0–45	responded to questions; pulse 120, breathing 24	.....
John Tabaka.....	35	coal stove gas	....	1–0	unconscious	40	3–8	0–30	semiconscious; pulse 80, breathing 20	.....
Boston Consolidated Gas Co.....	40	.....	....	1–0	poor	40	poor	0–25	improved	recovered
Redfield Fire Dept.....	..	coal gas	long time	....	cyanosed	..	3–4 shallow	0–20	conscious	recovered
Wisconsin Public Service Corp.....	..	gas main	0–10	0–15	unconscious	..	slight	0–15	good	recovered
Kings County Lighting Co.	30	suicide	0–25	0–8	unconscious	none	slow	0–20	conscious	well
San Diego Gas & Electric Co.....	..	gas main	0–10	short time	unconscious	weak	jerky	0–10 for 3 periods	conscious	O. K.
Long Beach Fire Dept.....	13	gas fumes	....	....	unconscious	..	faint	0–41	good	O. K.
	55	sucide	....	....	unconscious	..	...	0–28	fairly good	.....
	32	gas fumes	....	....	nearly unconscious	feeble	slow, shallow	0–24	conscious	O. K.
Public Service of Colo.....	..	gas main	....	....	unconscious	..	slight	1–0	conscious	well
Fall River Gas Works.....	70	open jets	....	....	unconscious	weak	shallow	0–18	conscious	very well

This seemed to have a quieting effect, they breathed easier and the pulse began to drop appreciably. The doctor in charge washed out their stomachs with salt and water and at 2:30 they were taken up into the ward and we were told that our apparatus was no longer required. We found that the boy died early the next morning, but the girl recovered. (Cambridge Gas Light Co., Cambridge, Mass.)

3. It is very probable that we have never kept such accurate record of our experiences with the inhaler as desired, but our experiences have satisfied us all that it is far ahead of the pulmotor formerly used by us. We feel sure that with the inhaler, at least four lives have been saved in four times used. It was used on December 18, 1924, for Mrs. A. S. who was to all appearances dead. This was a case of escaping coal gas. On April 21, 1924, at 6 A.M. one G. C., a very old man, was overcome by illuminating gas and found practically dead, he then being black. Officers worked on him at least 30 minutes with the inhaler and revived him. On March 19, 1924, at 3:30 A.M. one C. B. attempted suicide by illuminating gas, was to every appearance dead, and officers revived him after long efforts. On March 10, 1925, at 3:30 P.M. one H. L. H., while working in telephone company manhole was overcome, brought to surface by a fellow workman, and officers found him unconscious. With inhaler they revived him. (Police Department, Quincy, Mass.)

4. The H-H Inhalator was installed in all of our gas and electric plants a little over a year ago but I do not believe up to the present time we have had sufficient experience with this instrument to give you a great deal of detailed information as to its efficacy. We had one rather severe case, however, at the Fort Dodge Gas and Electric Company where a man of about 60 years of age was overcome with illuminating gas. The patient was entirely unconscious and respiration was very slight. Artificial respiration was of course started at once and after the instrument arrived and the patient started inhaling the gas, it was only a period of twelve minutes until he had regained consciousness. (United Light and Power Company, Davenport, Iowa.)

5. The third man was in a ditch repairing a broken pipe and he was unconscious when they got him out although he was breathing. Through a mixup in the telephone calls, the City ambulance got there before we did and took the man to the General Hospital. On arriving at the hospital which must have been about thirty minutes later he was still unconscious, and they were giving him straight oxygen. We started in with the H-H and in about fifteen minutes he was so he could talk. We continued to use it for about forty-five minutes and in about an hour his pulse was good, he had no headache and wanted to go home. In an hour and fifteen minutes from the time we got there, he dressed and we took him home. Next morning he reported for work and said he felt no ill effects from the gas. (Public Service Company of Colorado, Denver, Colo.)

6. Hired man sleeping in a separate building found by employer in closed room with coal stove smoking and throwing off gas, time in this condition unknown although remembers awaking and realizing condition but unable to get out of bed. When we arrived with machine he was unconscious, cyanosed, respiration very shallow and irregular, 3 to 4 per minute, but at times ceased for nearly one minute. This was timed by employer's brother. Inhalator was used for about twenty minutes in two intervals as after first time, respiration became weaker and shallow but improved quickly when Inhalator was reapplied. After final stopping, respiration was about twenty, color good. Patient had a headache for several hours and some bloody sputum for about one day, except for this had an uneventful recovery. (Fire Department Headquarters, Redfield, S. D.)

III. On the Value of the Oxygen-Carbon Dioxide Treatment of Gas Asphyxiation When Breathing Has Stopped and the Prone Pressure Method of Artificial Respiration Is Used with the Inhalation Mask in Place

Cases falling into this category are not frequent and are the most serious

test to which the new method can be subjected. The results so far obtained show that operators skilled in the prone pressure method can readily obtain a sufficient degree of ventilation to fill the lungs with the oxygen-carbon dioxide mixture and, this attained, spontaneous breathing tends to begin with encouraging readiness.

1. Upon being advised of the case at my office which was about two miles from the point where the man was overcome I immediately detailed a man from our Coke Plant Department to rush the H-H Inhalator to the scene of the accident where the men were working on him. He had, however, been resuscitated twice by artificial respiration before the Inhalator was used and became unconscious while being carried on a stretcher to our gate where the ambulance was waiting for him. After the inhalator was used, in connection with artificial respiration, he responded very quickly and did not lapse into unconsciousness again. (Bethlehem Steel Co., Johnstown, Pa.)

2. The first case was an employee of a local gas company who had accidentally inhaled a large quantity of gas containing CO. He was hauled to our plant in a truck with two men holding him as he was in convulsions and was struggling and fighting for air. Before he could be placed in position to have the oxygen-carbon dioxide administered, he had ceased breathing entirely and it became necessary to use the prone pressure method of resuscitation in conjunction with the Inhalator for about twenty minutes, at which time the victim was breathing of his own accord. The doctor made an examination of his condition at this time and recommended his removal to a hospital to recuperate. He remained in the Institution three days and reported to his Company for duty three days later. (Domestic Coke Corporation, Fairmont, W. Va.)

3. The first case in which I used it was on an old gentleman, 75 years old. I got the call at 6:15 A.M., December 26, 1923. This man was not breathing when I arrived. I proceeded to get the patient into position for resuscitation, Prone System, and had mask adjusted and started apparatus. After working on him for 20 minutes, I had him breathing and within half an hour, he was talking. After this I got him into a warm bed. This man was not taken to the hospital nor did we have a medical man present.

Case 2. September 8, 1924. On this occasion I was called to Victor Avenue, where one of our repair men, R. G., was overcome. He was repairing a broken main and had the sidewalk undermined.

This man was not breathing when I arrived but after about 15 minutes of the Prone Method and the inhaler, I got him breathing and talking and had him sent home in our car.

Case 3. This was a case of attempted suicide but not like the other cases, the Police and doctor were present and were using a lungmotor and told me I was too late. I asked the doctor if I should use our apparatus. He said I could try if I liked, so I started and, within a half hour, I had the man, who was between 60 and 70 years old, in a condition to have him removed to hospital. (The Consumer's Gas Co., Toronto, Canada.)

4. I am in receipt of your letter of April 19, relative to the treatment of a case of gas poisoning and in reply would state that this man was overcome by a mixture of 65% coal gas and 35% water gas. It was necessary for us to carry him down from the walk on the holder tank across the yard to an adjoining building. We immediately started to use the prone method and in two or three minutes the victim seemed to stiffen and we thought we were going to lose him. A new oxygen and carbon dioxide apparatus had just arrived and we started to give him this mixture. Very much to my surprise he regained consciousness within a very few minutes and we then laid him on a cot covering him with blankets to keep him warm. Shortly afterwards he lapsed into unconsciousness and two applications of the oxygen and carbon dioxide revived him very quickly. A doctor who had previously been called, upon examination stated that the patient's heart action was slow and he gave him a hypodermic injec-

TABLE 3.—SUMMARY OF ADDITIONAL CASES OF GASSING IN WHICH BREATHING WAS ABSENT AND WHICH WERE TREATED WITH PRONE PRESSURE ARTIFICIAL RESPIRATION AND INHALATION

NAME OF COMPANY	AGE OF PATIENT	SOURCE OF POISON	TIME OF EXPOSURE	TIME BEFORE INHALATION	CONDITION BEFORE INHALATION	PULSE	BREATHING	TIME OF INHALATION	CONDITION AFTER INHALATION	CONDITION NEXT DAY
			hr.–min.	*hr.–min.*				*hr.–min.*		
Commonwealth Edison Co.	47	suicide	2 to 3–0	0–40	unconscious	..	none	2–35	pulse 120, breathing 24	.....
Coney Island, N. Y.....	58	open gas jets	....	....	unconscious	..	none	0–25	breathing revived	.....
Reed Cranmer, M.D.....	2 adults	.....	....	....	unconscious	..	none	3–0	revived	recovered
Ft. Dodge Gas Co.....	23	gas in ditch	0–20	0–30	very bad; weak	..	none	0–30	good; normal breathing	O. K.
Long Beach Fire Dept.....	50	.....	....	....	apparently dead	none	none	1–51	revived; color good	.....
Kings County Lighting Co..	65	open gas jets	0–20	0–6	apparently dead	none	none	0–23	slight pulsation	O. K. after 3 days
	23	coal gas	2–0	0–9	apparently dead	none	none	0–23	conscious	good
	65	suicide	1–0	0–8	apparently dead	..	none	0–14	conscious	good
New Bedford Police Dept..	50	illuminating gas	....	....	unconscious	none	none	0–25	conscious	O. K.
	70	gas fumes	....	....	unconscious	..	..	0–20	conscious	O. K.

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tion of atropine. In a very short time the man became violent and the doctor said that he had a gas jag. The doctor left at this time. It took six men to hold the patient during these periods of convulsion which lasted for about ¾ of an hour and then finally subsided. For two or three days afterwards the man was physically tired and lame, due, I think, to these violent convulsions. I was very much surprised and pleased at the quickness with which the man was brought back to consciousness and I believe he would have been much better off physically if the hypodermic injection of atropine had been omitted. (Cambridge Gas Light Co., Cambridge, Mass.)

5. With reference to your letter of March 21st, inquiring as to the condition of Mr. H. when asphyxiated, wish to advise that the attending physician informed me that when he arrived on the scene, Mr. H. was entirely pulseless at the wrist. Just prior to the arrival of our men with the Inhalator, the attending physician injected a solution to stimulate the heart; this, however, did not have time to take effect before the Inhalator was put in operation along with artificial respiration. (Iowa City Light and Power Company, Iowa City, Iowa.)

6. Since the purchase of this instrument our men have only had one occasion to make use of it on an asphyxiated man whose breathing had entirely ceased. The report submitted gave us the information that the patient was apparently not breathing. At the time of arrival of the rescue crew only an occasional sigh was noted. The prone pressure method of resuscitation was at once started and the H-H Inhalator applied. The patient began to breathe quite deeply after five minutes from the time resuscitation measures were first applied. Fifteen minutes later he was able to breathe without external aid. After two days in the hospital the man returned to his occupation as a laborer doing trench work. (Lowell Gas Light Co., Lowell, Mass.)

Discussion

These direct accounts of gas accidents possess an informality which may cause them to be viewed with some distrust by those who have had serious investigative contact with the subject. At the present time carbon monoxide poisoning from all sources, fires, automobile exhaust, industrial accidents and manufactured gas, is a more serious medical problem in the United States than poliomyelitis or smallpox. It would seem that accounts of cases should have all the completeness and finish characteristic of the best medical reports, but as I have pointed out this is not and indeed cannot be the case. The author has great faith in data submitted by persons who view their work in a true spirit of interest and critical inquiry. He is convinced that such a spirit does actuate the men whose reports and opinions make up the vital part of this review. It is true that in many of the cases cited the patients would have recovered if they had been brought into the air and been left alone; and it is equally true that these individuals would have recovered if they had been treated by appliances other than the new inhalers. The strongest points in the general evidence seem to be the facts that the men reporting have had ample experience with prior forms of resuscitation and that in spite of this they feel the new technic provides recovery more rapidly, more certainly, and with fewer unpleasant after effects than has been possible in the past. Not all of this feeling can be due to the natural tendency of men to follow a new and highly endorsed medical maneuver. New remedies always gain a following, but the following in this case consists of men old in the work at hand, and it has grown steadily during two years.

Against the affirmative evidence submitted I have been able to find a

small amount of counter opinion. Sayers and Yant (1) in 1923 studied the rate of elimination of carbon monoxide from the blood under air breathing, oxygen breathing, and oxygen plus carbon dioxide breathing. They found that the "CO_2 mixtures removed the CO from 25 to 50 per cent faster than did the pure O_2." They continue: "Henderson states breathing CO_2-O_2 mixtures produces an increase in blood pressure. This probably causes an increase of flow of blood through the lungs, and would thus aid in the elimination of CO; but in victims that have been gassed over a comparatively long period (several hours), the heart might perhaps be weakened and unable to withstand the increased stimulation for breathing caused by the CO_2. However, if the patient is under constant observation, overstimulation may be avoided by temporarily stopping the use of the CO_2-O_2 mixture; or, as suggested by Henderson and Haggard, this effect may be prevented by the administration of atropin. Lower percentages of CO_2 in O_2 produce less effect; and it is hoped that a safe percentage may be found for routine first-aid work."

The same criticism is found in a brief monograph on "Carbon Monoxide Gas Poisoning" by Rossiter (2): "Their experiments [referring to the work of Henderson and Haggard], as well as those performed by the Bureau of Mines, have shown that a very much quicker resuscitation is obtained when the Carbon Dioxide is used.

"However, it must be remembered that these experiments were performed on cases where the saturation of the blood with the CO was not over 40 or 50%, and while there is no doubt about the CO_2 increasing the depth and number of respirations, yet it must also be remembered that in severe cases of gassing the percentage of saturation is much greater and that the heart is greatly weakened, so that with this sudden excessive stimulus it may fail. I would not, therefore, recommend this form of treatment, except in expert hands, nor do I believe that in its present state of development it should be used in the severe cases of gassing."

The author is not clear as to what is meant by overstimulating the heart. It is true that carbon dioxide inhalations do raise the blood pressure and it has recently been shown that such inhalations increase the blood flow through the lungs in human subjects. It seems impossible to describe any two reactions which express improvement of the circulation more emphatically than do the two mentioned. Blood pressure falls badly toward the end of carbon monoxide poisoning, and cardiac output suffers. A low blood pressure and a reduced output of blood cause a poor coronary circulation and the vicious circle which results turns to the heart muscle as the seat of serious damage. High concentrations of carbon dioxide in the blood will cause the heart to fail, but there is no evidence that such concentrations as are attainable by use of the 5 per cent. of carbon dioxide provided by the new treatment can do harm. On the other hand, there is ample evidence to show that a normal carbon dioxide content of the circulating blood gives better cardiac function than a reduced carbon dioxide. Henderson and Haggard

have shown that not infrequently, and essentially in prolonged poisoning by carbon monoxide, the blood carbon dioxide is reduced. All the information at hand would suggest that with the exception of increasing the blood oxygen no measure could be of more benefit to the heart than bringing the blood carbon dioxide of such patients up to normal and that the concentration of carbon dioxide attainable from the gas mixture used in the inhalation treatment cannot rise high enough to be anything but beneficial. It is well to be cautious in regard to a new medical procedure but in this particular matter the very abundant information on the physiologic effects of carbon dioxide on the heart, coupled with the experimental and field results on the effects of the 5 per cent. carbon dioxide concentration used in the inhalation mixture seems to set at rest the suggested objection.

A recent paper by Nicloux (3) and his associates verifies the general finding that breathing 95 per cent. of oxygen plus 5 per cent. of carbon dioxide gives a more rapid removal of carbon monoxide from the blood than is attainable in any other way. The experiments cited are on two dogs and differ from American results in the shape of the elimination curves and perhaps most essentially in the fact that little difference in the speed of carbon monoxide elimination exists in favor of the oxygen-carbon dioxide mixture over pure oxygen. This paper may cause a further technical exploration of certain features of carbon monoxide poisoning, but it is not a criticism of the new treatment.

A further point which has come to attention repeatedly during the past two years appears in Rossiter's (2) paper: "The Carbon Dioxide and Oxygen treatment can be used with the Pulmotor by charging the tanks accordingly, but by so doing the amount of oxygen reaching the lungs is decreased." This statement is incorrect. During the work of the Commission the members were asked to approve a simple oxygen inhalation apparatus for use with the oxygen-carbon dioxide mixture. Owing to the fact that the inhaler for oxygen alone was not built to meet the quick increase in volume of breathing which occurs when carbon dioxide is present, this simple arrangement failed of approval. It is not possible to use the inhalation feature of the pulmotor with the oxygen-carbon dioxide mixture and the same thing applies to other apparatus not especially constructed for the purpose. The question has also been asked as to whether it would not be a good thing to use the oxygen-carbon dioxide mixture on the positive side of the pulmotor or as the gas pumped in by the lungmotor. In the case of the pulmotor the amount of carbon dioxide delivered in this way would not be above 3 per cent. at the best and the oxygen would be in the neighborhood of 40 per cent. The lungmotor would deliver the full concentration of 95 per cent. of oxygen and 5 per cent. of carbon dioxide, provided the mixture really reached the lungs. It is the unreliability of these two devices for accomplishing this end which caused the Commission to recommend that their use be given up; a mere change in the gas mixture utilized cannot affect this recommendation. The third body of evidence submitted deals with cases in which breathing was absent and the

initial move in resuscitation was a successful combination of prone pressure artificial respiration and air approved inhaler. It is not necessary to carry other devices. Training in artificial respiration and the inhalation treatment are our best resource in gas poisoning.

In line with the above discussion, questions have arisen in the following communication which are of much interest:

We do, however, occasionally encounter cases where the application of the prone pressure method of resuscitation seems to us impracticable, or actually impossible. We therefore beg leave to make inquiry concerning some of these cases, as to what you would recommend, since in our experience, the lungmotor seems to be the only means applicable. As you know, the Gas Company is frequently called on to attempt to revive persons who are unconscious and apparently dead due to other causes than the inhalation of gas fumes. One instance of this nature is given below:

Recently our Emergency Crew responded to a call from a physician on a maternity case. A child had been born whose heart was beating but breathing could not be started. There were two doctors in attendance, both of whom agreed that the Schafer method or Sylvester method of resuscitation could not be applied, because of the size of the infant and because it was so fragile. Both doctors in attendance, as well as our emergency men, believed that a lungmotor would have been useful in this case. The doctors indicated that the reason they sent for the Gas Company was because of their belief that a lungmotor was included in their equipment. In any event, all available efforts to save this infant's life were unavailing.

Another instance where the prone pressure method would appear inapplicable was that of a woman in late stage of pregnancy who had been overcome by gas fumes while lying in bed. Fortunately, the patient referred to was breathing, and it was possible to stimulate breathing further by the use of the CO_2 and Oxygen mixture. We are desirous to have your suggestion as to what procedure our emergency men could have followed in case upon their arrival the patient's breathing had stopped.

It is also possible to imagine other examples, such as that of a very old person, or person suffering from a heart attack, where it would be dangerous to move the subject from bed to floor in order to apply prone pressure method satisfactorily.

It is not the intent of this letter to offer arguments in favor of the lungmotor, but we are seeking your advice on cases of unusual nature such as described above. Our emergency men are looking to us to give them definite instructions and we do not feel capable of giving this advice or instruction just yet. May we hear from you in this regard? Be assured whatever helpful suggestions you might offer will be greatly appreciated. (Detroit City Gas Co., Detroit, Mich.)

The fact that the inhalation treatment must not be permitted to be the main support in electric shock has been discussed. The same thing is true of drowning. I have reports of cases of both these conditions which seem to show that the oxygen-carbon dioxide mixture has worked well. Neither furnishes a setting which makes the treatment imperative and the same thing is even more true in the case of infants in whom breathing does not occur. Inquiry into the methods of treating this last condition reveals the fact that some years ago when devices such as the pulmotor and lungmotor were new, obstetric hospitals either purchased them or tried them out. As time has passed, the efficiency of simpler measures has again prevailed and the best obstetric practice no longer employs either of these instruments, indeed fears them. I have obtained a report of twenty cases of infants treated with oxygen-carbon

dioxide mixture. In sixteen of these the treatment was successful but the results are not significantly impressive, and at the moment it is not possible to contend that pulmotor, lungmotor, or inhaler offers assistance of more value than the simple measures which should be familiar to physicians.

It is always hard not to do something in an emergency, but it is as bad to do the wrong thing as it is to do nothing at all. In the case of nonbreathing infants the best obstetric practice regards the pulmotor and lungmotor as potentially harmful and avoids their use. This being the case and any degree of proof that the oxygen-carbon dioxide inhalation is surely useful being lacking, it would appear best to recommend that calls to treat such infants be considered outside the province of rescue crew work. The fact that physicians still make these calls is a survival of ignorance, in the perpetuation of which it is unnecessary and wrong to co-operate.

Individuals, who for some reason cannot be placed in the prone position, should be treated by a combination of the Sylvester method of artificial respiration with the inhaler. At the present moment the author knows of no cases in which primary use of either pulmotor or lungmotor has been essential nor does there seem any reason to anticipate such instances. It is therefore recommended that in training rescue crews it be called to their attention that occasional emergencies may demand the Sylvester method and that instruction be given in it in order to meet rare situations.

A final matter on which information should be secured is the incidence of sequelae—pneumonia, etc.—following the inhalation treatment. At the present time we are unable to offer any facts in regard to this and when data are available they will not be comparable with figures on any other single type of treatment.

Summary

1. The treatment of carbon monoxide poisoning by inhalation of a mixture of 5 per cent. of carbon dioxide and 95 per cent. of oxygen has been in use for two years.

2. At the present time 300 organizations possess approved apparatus for giving this treatment. One hundred and eighty of these have replied to a letter of inquiry, 110 cases being reported in enough detail to be considered in this report, though the replies indicate a much larger actual use.

3. All the evidence obtained indicates: (*a*) The inhalation treatment is exceedingly valuable in mild gassing, relieving or preventing the occurrence of headache, nausea, etc. (*b*) Serious cases, still breathing, revive rapidly and thoroughly. (*c*) It is practicable to use the inhalation treatment with prone pressure artificial respiration when breathing has ceased.

While the foregoing report was being completed, the author corresponded with Dr. R. R. Sayers, Chief Surgeon of the United States Bureau of Mines and former member of the Resuscitation Commission, in order to obtain his opinion upon the general question of oxygen-carbon dioxide inhalation. As a final result of an exchange of letters, Dr. Sayers has authorized the publication of the following statement covering his views on the subject.

Reference to Dr. Nicloux' published work is given in the bibliography.

In our experimental work on men and on animals we found that breathing oxygen removed carbon monoxide from the blood about four times faster than did breathing air and that the carbon dioxide-oxygen mixture removed it about five times faster than did air. However, our experience with both men and animals indicates that the carbon dioxide-oxygen mixture gives no better results than does pure oxygen when judged by the time necessary for recovery after a given exposure to carbon monoxide and a given blood saturation and the condition of the animal or victim after treatment is about the same. The use of oxygen is far more practicable in the mining industry than is the carbon dioxide-oxygen mixture. Dr. Nicloux, Professor of Biological Chemistry, University of Strasbourg, France, and Commander Walton, of the U. S. Navy, assigned to Edgewood Arsenal, have confirmed these results. Dr. Walton's findings have not been published to my knowledge.

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THE HUMAN SIDE OF HOW TO DO IT BEST*

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THE subject of industrial psychology is an interesting one to display; interesting because it is comparatively new, because it deals, in practical life, with one of the great economic problems of this age—how to improve human relations by producing at less cost while giving a higher time rate of pay. For these reasons one can liken it to selling a product, both spiritual and physical, for which the buyer need not ask a guarantee because the product will not wear out but must continue to benefit him, either consciously or unconsciously, as long as he uses it. The product here for sale is the outcome of the study of the human mind of all those who do things and expend energy in work or in play in order to attain an end.

In play men are notably more willing to exert themselves than in work. The reason for this difference cannot be attributed solely to the sporting influence of play; it must further be added that play is voluntary, while work is in most cases involuntary. Moreover, ordinary play does not involve the problem of money needed to keep body and soul together. In play there is a spirit of emulation, personal freedom to engage in it or to abstain from it, and an absence of the problem of money. In work, by contrast, there can be little spirit of emulation where the age of machinery causes everyone to begin at a certain hour and not to stop before closing time, and where the necessity of earning a livelihood has for many become a grindstone; the result is that in work one is more careful about one's bodily and mental effort than in play.

The Problem of Fatigue

The subject of the present paper applies both to work and to play, although it is more particularly concerned with work, which is the more interesting of the two.

Doing things means expending energy, and this leads to fatigue. Fatigue is more appreciated in work than in play because the mind is more easily influenced when it is depressed than when it is feeling buoyant. Fatigue is the all-important phenomenon which interests the industrial psychologist; it results from muscular or nervous effort and, while being local in the beginning, becomes general when those efforts become so sustained that the local functions can

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no more cope with it. General fatigue affects the nerve centers, controlling all bodily functions; thus the proper working of these is influenced. In a word, fatigue is a sort of intoxication which incapacitates man. To prevent such incapacitation is the aim of the industrial psychologist; in other words, he aims at lessening human fatigue resulting from industrial processes, as they are in effect today. A slight diversion here may be allowed. Physical exercise, which of course produces fatigue, is essential to the efficient working of our bodily system; it may, however, be pushed too far when overfatigue results. There exist, then, healthy and unhealthy fatigue and it is the latter which is the subject of this paper.

The question which is all-important is when and because of what does healthy fatigue become unhealthy and injurious. In a general way it becomes injurious the moment when local bodily functions can no more cope with localized fatigue, the moment when localized fatigue begins to spread and to affect the nerve centers and thus becomes general fatigue. Since industrial psychologists deal with individuals, a second question arises as to when this man or woman, working at such and such a process, becomes generally fatigued. This problem is, under the conditions in which we live, insurmountable. There are hardly two human beings alike in their resistance to the fatigue resulting from doing the same sort of work; while the "same sort of work" is never performed in exactly the same way by two people. What then is the way out? Is it advisable to try to find experimentally how much energy—in foot pounds—a person expends in performing certain work? Is it scientifically correct to construct machinery in a certain way because a certain human being, when tested, has approached great efficiency in working this piece of machinery? It is to be feared that this school of thought—continental in its inception—will not bring about the solution of the problem presented. It seems more in line with the nature of the difficulties to acknowledge the many variables that enter into the problem and to approach it, at any rate practically, from a different point of view altogether.

The indirect way of reducing fatigue which results from doing certain work, by applying industrial psychology through motion and fatigue study—changing the movements, or relative positions, and harmonizing the surroundings of the worker—must be the first line of attack in the solution of a problem full of variables which cannot be standardized.

Types of Industrial Fatigue

In approaching the problem in this way the different types of industrial fatigue may be grouped as follows:

1. Fatigue due to work done for which the worker is temperamentally not suited.

2. Fatigue due to making unnecessary motions.

3. Fatigue caused by unsympathetic surroundings.

The first is a kind of fatigue which is caused within our nerve centers and, by its very nature, produces general fatigue. The second is local fatigue because it is the result of local

muscular action and becomes general fatigue only when it is increased to such an extent that the local functions can no more cope with it. The third is a kind of mental fatigue; it produces general fatigue, but its cause is external.

Methods of Fatigue Elimination in Industry

I. Vocational Selection

The definition of the first kind of fatigue, given above, immediately suggests that the way to eliminate this fatigue is to find for every man the work for which he is temperamentally suited; in this way the prime cause of this particular tired feeling may be removed. In practice this means vocational selection which is still in its infancy, although it has attracted a good deal more attention both in the United States and on the Continent than in Great Britain, owing partly to the inherent conservatism of the British, a characteristic which must not be allowed to stand in the way of progress. Only when public opinion realizes the benefit—as it did when railway engine drivers had to be tested for eyesight, which is only a small part of vocational selection—will vocational selection have won the day.

A more detailed account of how the human nervous system and the brain perform their duties will possibly be helpful here. When a finger, a hand, or any other part of the body is moved as a result of the will, a nervous excitation is produced in a part of the brain; it is transported along the nervous system to the muscle required which then contracts and in so doing does the work willed. Although medical opinion is not yet in full agreement where the most important seat of fatigue lies, it is generally understood that it lies in the central nervous system.

When a motor car runs over a field on which many cars have run before, its wheels have comparatively little resistance to overcome because a path has been formed which is smooth. If, however, the car is the first to traverse this field, its wheels come into contact with rough ground and the engine has to spend the greater part of its power in keeping the car moving. If, in the first case, the car does 30 miles an hour, it will do, in the second case, barely 10 miles an hour.

Something similar happens in the nervous system. When a baby for the first time wants to get hold of something, the movement of the little hand is slow and erratic because the path of the nervous excitation from the brain is quite new, quite untraversed; there is much brain resistance and the baby is immediately fatigued. As time passes and the baby, and later the child, has made that same movement hundreds of times, no particular effort is required, no fatigue worth speaking of is felt, solely because the nervous paths are smoothed down until there is hardly any resistance. (Incidentally, this lessening of nervous fatigue caused by the repetition of a similar nervous excitation is the reason why mass production has been possible.)

Although in this way practice decreases fatigue, this fact applies to all men, and it does not explain why some men can do one thing so much better than others. The same

example will help in understanding this problem, however. If a road, such as the Liverpool-Prescot one, has cobble pavement for a distance and then asphalt, then, taking for granted that the same number of cars have passed over both parts of the road, there is still a difference of resistance against the car wheels when they travel over the whole road. On the asphalt stretch the car will go at 40 miles an hour, on the cobble pavement it will do only 38 miles an hour. So it is in the nervous system. That of one man offers more resistance to the same kind of excitation than that of another. We may say that the nature of one man's nervous system is more easily smoothed down by one kind of nervous excitation than by another. And, once it is known which kind of nervous excitation is offered least resistance, one characteristic is found for the work for which the man under test is most suited.

The next question which must be answered is concerned with what characteristics can be defined in such a way. The most important one is concentration of the mind. As an example, it may be possible for one man to concentrate easily on one thing and one thing only at one time, while if he is asked to attend to two or more things at once he will be a failure. A man of this type is ideal for inspecting work or for cutting diamonds, but he would be of little use if he had to attend to four or more machines. Such extremes have purposely been cited, but there are many types of men in between.

Tests to decide which kind of mind concentration a person has and tests to find the personal equation—the reaction of the senses—constitute the more or less purely psychologic tests. In a vocational selection laboratory industrial psychologic tests are added, such as tests to ascertain the sensitiveness of the eyes, and of the muscles of the arm, hand, and fingers. After testing the mentality, where the ability to plan and to follow up instructions are of great importance, trade tests are used to find out whether the testee, who may have all the single characteristics required for a certain profession, has also the ability to combine these in working.

Vocational selection on psychologic lines is, however, still in its infancy; great steps forward, as well as some backward, may be expected.

II. Motion Study

Fatigue due to performing unnecessary work is theoretically very simple. When one is able to eliminate movements or can combine two movements so that they flow into each other requiring less energy to perform them, then energy is saved and less fatigue will follow. But, as usual, the matter is not simple; for modern industry has provided this branch of industrial psychology with every conceivable type of process, and with a limitless variety in motions and in the relation between machine time and handling time, which together make up process time.

Motion study, as this branch is called, can be applied in a way from which almost immediate benefit can be derived, but before proving this by giving examples, it is necessary to show why motion study exists. Anyone having to make the same movement time after time—and there

are processes where exactly the same movement of the hands returns with absolute regularity every four-fifths of a second—might be expected to have thought out for himself or herself the easiest way of doing it. But this is not the case; partly because there are too many factors involved, but mainly because when a man starts work he simply does it in the same way as those who are already at work. There are but few who show any individuality in their work. This is the reason why motion study exists.

Superficially it looks as if every process where hands, feet, and arms are used is open for study and improvement. But in practice the saving must be greater than the work and time spent in getting the improvement; consequently only motions that recur repeatedly in exactly the same way are subjected to these studies. Here the input is small; the output, great.

There is one more question: Why is it that motion study is comparatively new? The answer is twofold: First, the progress of industry has been mainly sought in perfecting machinery, and the men who worked these new machines were left to themselves; secondly, this high-speed machinery resulted in such quick and small movements on the part of the operator that they were lost sight of. In this respect, too much stress cannot be laid on the fact that motion study always deals with small motions, so small sometimes that in practical life those in authority do not quite see why so much trouble is taken; only when they see results do they become enthusiastic believers. It is always easier to print a statement like this than to convince the reader; therefore two examples are given so that the statement may have more weight.

In one department of a knitting factory in which gloves were made, handknitting machines were used. These machines consist mainly of V-shaped steel beds with transverse grooves for the needles; saddle arrangements are moved to and fro over these beds in order to move the needles up and down and in order to open and close the needles. The girls who worked these machines moved a handle, fastened to the saddle arrangement, in part of a vertical circle, thus moving the saddle as stated. All the girls in this department, instead of leaving the factory immediately when the bell rang, were observed to stay on, sitting in their chairs. Here was something radically wrong, both for the girls and for the company, because during the last hours of the day the company was not coming up to standard production, while the girls themselves were overtired. The problem was to find the cause. After carefully watching the process and the operator, and especially the movements of the latter, it was found that in order to keep up a rhythmic swing of the handle the operator swayed the upper part of the body in harmony with the movement of the saddle of the machine. In order to be able to sway, the feet were placed about 18 inches apart. Ankles are so made that they support the body with least fatigue when the angle between floor and leg is almost 90 degrees. When standing with feet apart the angle was about 84 degrees, and this attitude was maintained the whole day long. In order to overcome this fatiguing position the girls

were given slightly sloped planks under their feet, thereby restoring the angle of support to almost 90 degrees. From the day these simple foot rests were put into use, fatigue diminished and production increased; and, as the operatives were on piece rate, they earned more.

A second example of motion study affected the way bags of flour were weighed in a mill. In this mill the bags were put on a beam balance. When the bags were of the required weight, the pointer was vertical and in between the vertical suspending arms of the balance. The bags weighed 110 pounds, and 1200 of such bags were weighed during the day. When this process was looked into, several points were considered. First, the pointer, which was made of unpainted steel, moving between two arms of the same color, was difficult to see; the difficulty of reading accurately was further increased because the operator had to stand sideways and therefore was not able to see when both scales balanced. But there was more. The beam balance was hung from the ceiling and the operator had to move his head upward (two to three times per bag) in order to see the pointer at all. These difficulties were overcome in the following manner: The pointer was turned 90 degrees, thereby doing away with the head movement which caused fatigue to the neck muscles; it was painted white so that it would stand out clearly against the black of the beam, on which a horizontal white line was painted as a measure when balance was reached. Here again both parties gained. The man expressed his high satisfaction that same evening although he had been at the work for many years, and the company was now certain of delivering correct weights.

The above examples are taken from widely different industries and the writer would impress on his readers two facts: (1) Motion study can be applied in every industry where processing involves the quick repetition of movements on the part of the worker; and (2) the cost of the change from an old to a new process is almost always infinitesimal.

III. Harmonizing the Surroundings

The third type of fatigue is due to unsympathetic surroundings. The first two types dealt with fatigue generated from within; this one is due to outside causes. Great noise all day long, fear of hurting oneself, bad atmospheric conditions, long spells of working hours, and exposure to great heat are here examples of causative factors. Remedies are not always easy, because the conditions under which a process must be carried out are sometimes difficult to alter, while in many cases it cannot yet be said with certainty what effect these factors have on the worker individually. A great many experiments may be made to bring the solution somewhat nearer. Thus rest pauses may be introduced, or tea served, but industries are not a very happy hunting ground for the serious experimenter who wants all factors constant but the one on which he is engaged.

Before leaving the application of industrial psychology to processing, it must be said that those who apply it must have great, very great patience; they are bound to come into

almost immediate contact with habit and there is no other human characteristic which is so tenacious. Even people who are willing to make a change are constantly and quite unconsciously lapsing into the old habit. Here, also, people vary—some are very adaptable; others are the reverse; while some become nervous when they are only watched. Therefore, the application of industrial psychology in a works takes a long time.

Fatigue Elimination in the Office

The foregoing has dealt mainly with factory processes; but industrial psychology is equally applicable to office proceedings—in other words, it can also be applied to those who control factory operations. Here control work, if it may be so styled for the moment, also results in fatigue, which may be chiefly mental. Such work consists mainly in (*a*) knowing what is actually happening in the factory, and (*b*) setting or altering conditions of work so that it will be performed more efficiently, not only for the moment but also for the future.

Control work really has become of paramount importance since the small shop of the last century gave way to the big establishment of today. It was, under the old conditions, possible to have not only a bird's eye view, but also very good detail knowledge. Today, those who control must perforce have recourse to figures, to statistics, in order to be able to know what is going on. In a shop where ten men worked together, it was within the capacity of one man to know precisely the setting of each of the machines, as they were simple; he could tell exactly what every man was capable of doing and how much he earned; he could keep his eye on waste of material, waste of time, and waste of tools. To gage the position today, ask any foreman of a big shop any of the above questions; he will go to his office and look up his figures, because it is humanly impossible to carry all these data in one head. Although it may be regretted that things have come to such a pass, the facts cannot be disputed. Control men of today have called in the help of tools that assist them to remember vital facts. Data are required which must be recorded; the card on which they are written is looked up and, in searching for the particular data needed, the eye wanders up and down the mass of information. Here lies one more difficulty which must be taken into account. A mere figure is of very little use; only when it is known how it compares with other similar figures is it of value. Thus the control men want to know the highest, the lowest, or the mean. The mental process of obtaining the required figure and of finding out its relationship to others, therefore, is this: The eye wanders up and down the row of figures, keeping in mind all the time the highest, or the lowest (as the case may be). This takes time and mental energy. It is much easier to look at a simple chart which at a glance shows the absolute and the relative value of the data which are required.

The limits of this article do not permit quoting more examples of how industrial psychology can benefit those in control; suffice it to say that its application in this sphere is as varied and as helpful as in the shops.

Conclusion

An article describing what industrial psychology is, how it is applied, and how it benefits those in industry would not be complete if it did not touch one important sphere of business life. The aim of business is to sell something for more than it has cost, thereby making a profit; and the chief problem today is how to lower the cost without lowering wages. Industrial psychology can help to attain this end. It can lower the human energy required to do work, thereby decreasing the time required in production.

The application of industrial psychology benefits equally the worker and the employer; too much stress, however, cannot be laid on the fact that the worker benefits first, and only as a result of this, the employer. It is the first step in humanizing industry.

PHOTOMETRIC METHODS FOR STUDYING AND ESTIMATING SUSPENSIONS OF DUSTS, FUMES, AND SMOKES*

PHILIP DRINKER, R. M. THOMSON, AND JANE L. FINN

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Harvard School of Public Health, Boston, Mass.

IN PHYSIOLOGIC problems proceeding from the inhalation of dusts, fumes, and smokes, it is desirable to know something of the size and dispersion of the particles as they occur in the air.

In the case of lung damage by silica, Watkins-Pitchford and Moir (1) found that the particles of hygienic significance were within the approximate limits of 0.5 to 5 microns. One of us (2) has recently shown that the size distribution of these same silica particles in lungs, as well as that of non-silicious particles in dust cells collected from the sputum of living and healthy subjects, lies within still narrower limits and obeys a definite law.

In the inhalation of substances such as the more dangerous fumes of lead and its compounds, Blumgart (3) has pointed out that absorption of lead can occur through the upper respiratory mucous membrane, upon which large and small particles are deposited plentifully. The extent of the damage is evidently governed by the size and the surface area of the particles inhaled. Hence in considering the hygienic aspects of dust inhalation, size determination is very important, and it is helpful to apply a method for examining dust suspensions which will distinguish between the size of the particles and determine their dispersion in the air.

We believe that photometric methods fulfil these requirements — methods which consist in the measurement of the amount of light (*a*) reflected and scattered by the particles, as in the Tyndall beam, or (*b*) transmitted through known distances of the suspension.

TOLMAN AND VLIET'S TYNDALLMETER

For studying the rates at which smokes cleared up both in still and in moving air, Tolman and Vliet (4) developed the Tyndallmeter. A copy of it, made after their design, is shown (Fig. 1) attached to our gas cabinet (5). The meter consists essentially of a small automobile lamp ("The Tyndall Lamp"), inserted at A, and a condensing lens placed across the nipple B, close to A, giving a parallel beam in the observation chamber C. The cross section of this beam is determined by a square hole cut in a black metal disk fitting tightly against the glass window within C, near its junction with B. The Macbeth illumin-

* Presented at the Meeting of the Chemical, Metallurgical, and Mining Society of South Africa, held Sept. 19, 1925. Published by the courtesy of the Society.

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ometer,[1] G and D, fits into C and is used to measure the strength of the Tyndall beam in terms of brightness or "apparent" foot candles. Smokes, fumes, or dusts are pumped through the observation chamber across the beam of light, and liquid suspensions are placed within the chamber in large test tubes.[2] The two longer pipes extending to the left and below C serve to absorb the light beam and to give a dark background for photometric measurement.

Tolman and Vliet's detailed description of the illuminometer follows (quotation marks indicate that the item is listed by its trade name):

> . . . . The *central examining chamber* is a "1½" railing cross with side outlet," with a 1" hole bored opposite to the side outlet. This hole takes a rubber stopper which in turn is bored to fit the end of the examining telescope of the illuminometer. Glass windows are provided to prevent the entrance of smoke into the telescope tube of the illuminometer and into the Tyndall beam tube. The *Tyndall beam tube* consists of a "1½" nipple" 4" long containing the diaphragm and lens, and a "1½" tee" fitted with a "plug" at one end and a "reducing bushing" at the other to take the connector for the electric bulb. The *electric bulb* is a "30 candle power, Type C, gas filled, 6–8 volt lamp" such as may be purchased for automobile head-lights. It fits into a "standard anchor double-end socket," and connection is made at the other end with a "standard anchor bayonet connector." The *lens* is a 1½", 20 diopter, double-convex, such as can be purchased from an optician. The *diaphragm* is made of sheet metal and has a ⅝" square hole arranged so that the observing telescope is perpendicular to a side of the square. The *absorbing tubes* are "1½" nipples" 12" long with "caps" painted black on the inside. The straps for fastening the illuminater to the apparatus are made from "1½" grabber hangers." The arrangement of the parts of the apparatus is such as to obtain a nearly parallel beam, the light focussing as a matter of fact about twelve feet away. Both lamps were supplied with current from storage cells, that for the illuminometer[3] being adjusted with the stock rheostat provided, and that for the Tyndall beam by an ordinary carbon compression rheostat.

The Macbeth illuminometer is a light, compact, portable photometer, intended for such purposes as measuring the intensity of illumination on any object or the candle power of a light source. A small electric incandescent lamp, the illuminometer lamp, is fixed to a moving arm, which is shifted back and forth until its intensity of illumination is equal to that from the unknown. The light from the latter is seen through the telescope of the instrument as a round spot about one-eighth inch in diameter, whereas that from the illuminometer lamp appears as a circular ring surrounding the spot. When the brightness of the spot and of the ring match the foot candles illumination is read off on the scale marked on the moving arm.

With this instrument, each observer makes his own initial standardization with a standard lamp supplied by the manufacturers. The scale of the illuminometer is set at 3 foot candles, and 215 milliamperes are passed through the standard, which shines upon a translucent plate. The ob-

[1] Made by the Leeds and Northrup Co., Philadelphia, Pa.

[2] These may be made of ordinary glass tubing, free from surface defects. They should fit into the observation chamber snugly, in order to reduce the amount of light reflected.

[3] Dry cells are satisfactory.—*Authors' note.*

server then sights on the test plate, sets the moving scale of the illuminometer for 3 foot candles, and determines the amperage he requires in the illuminometer lamp in order to match the light reflected from the standard. This value will also be about 215 milliamperes, although it will usually vary slightly but perceptibly with different observers.

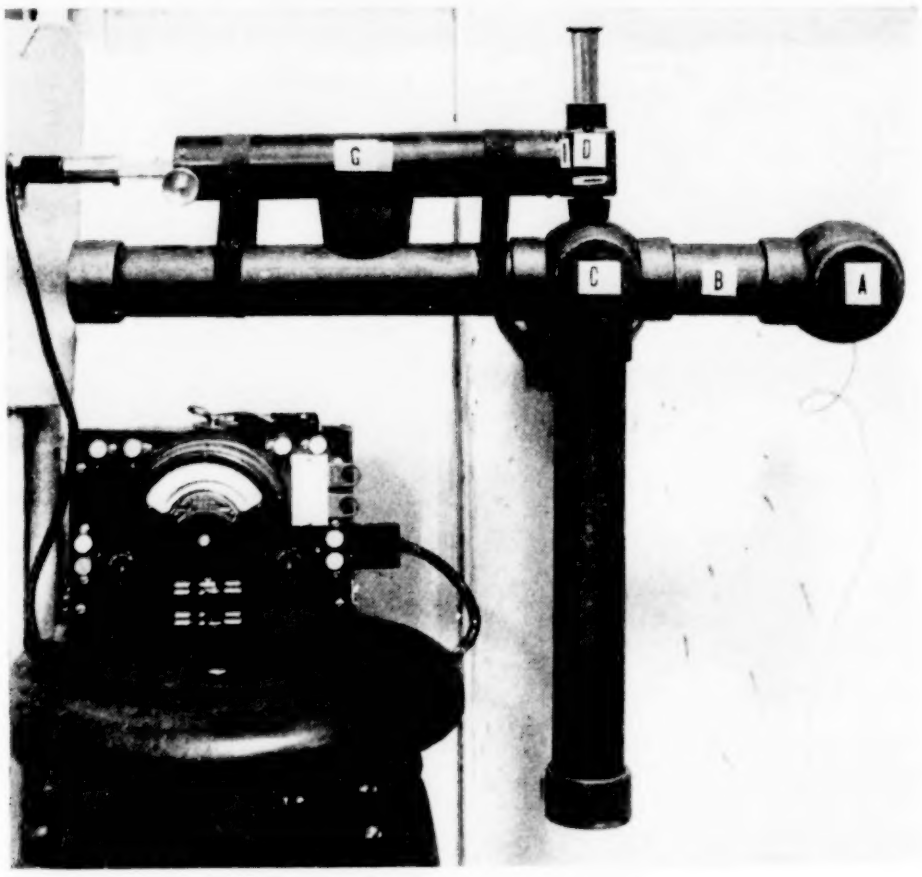

FIG. 1.—Tyndallmeter and Macbeth illuminometer attached to gas cabinet.

Neutral Absorbing Screens

The scale of the instrument reads from 1 to 25 foot candles. If higher or lower intensities are to be read, neutral absorbing screens are inserted in either of the slots I (Fig. 1), and the scale reading multiplied by the absorbing factors of the screens.

In our work, we have found it advisable to standardize the illuminometer for about one-twelfth of the usual amount, *viz.*, for 0.25 as well as for 3 foot candles. (Tolman and Vliet used 0.6 foot candles.) The lower value is obtained as follows: Standardize for 3 foot candles in the usual way, getting a value of about 215 milliamperes; then find the milliamperage on the standard lamp necessary to give 3 apparent foot candles when an absorbing screen of known strength (about one-twelfth) is placed in the beam from the illuminometer lamp. Remove the absorbing screen and find the milliamperage in the illuminometer lamp required to balance the light from the standard. With screens of transmitting power of approximately one-twelfth, the new milliamperage will be in the neighborhood of 173, instead of 215. The purpose of this twofold standardization is that an intensity of light may be used in the illuminometer lamp approximating the expected bright-

ness of the Tyndall beam. Since the latter varies greatly, it is convenient to have at least two different milliamperages for use on the illuminometer,

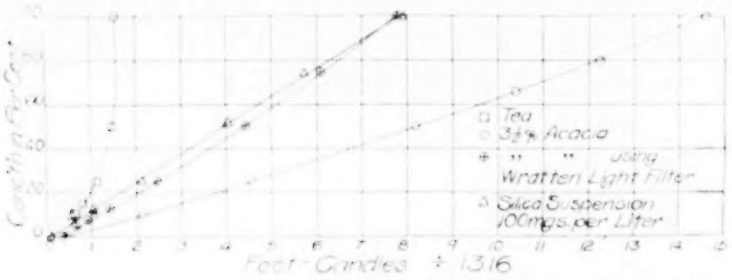

FIG. 2.—Curves of true colloids, tea and acacia, in water, compared with aqueous suspensions of coarse silica. Note the reduction in Tyndall readings when using Wratten light filter.

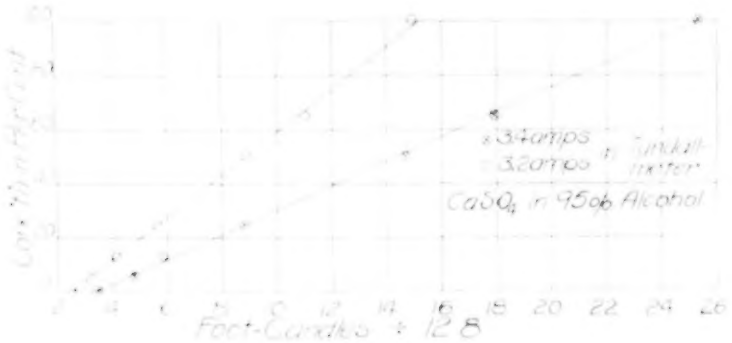

FIG. 3.—Curves showing the accuracy of the Tyndallmeter in estimating the concentration of a colloidal suspension of $CaSO_4$ in alcohol. Note that Tyndall readings are reliable with different amperages in Tyndall lamp.

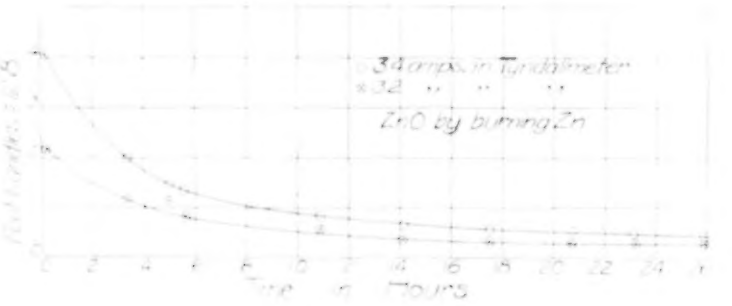

FIG. 4.—Settling curves of zinc oxide suspended in air of gas cabinet.

and to apply whichever is better suited to the suspension under examination.

Standardization of the Tyndallmeter

As will be seen from Figures 2 and 3, the strength of the Tyndall beam varies with different suspensions and with the intensity of illumination from the Tyndall lamp. Therefore the instrument must be standardized in terms of some arbitrary measurements which can be reproduced at any time. For this purpose, Tolman and Vliet used either opal bulbs[4] or aqueous suspensions of silica (Fig. 2), in which the size of the particles was known. We find both methods satisfactory, but we prefer the opal bulbs and keep several on hand in case of breakage, each marked so that it can be inserted in the examining chamber in the same way each time. Standardizations are then made with any desired amperage in the Tyndall lamp.

Color of the Light from the Tyndall Beam

Tolman and his associates (6) showed that the intensity of the Tyndall beam depended on the size and dispersion of the particles and that "in general for smokes, increased subdivision results in increased Tyndallmeter reading." To this we may add that increased subdivision changes the color of the reflected light from the region of the orange toward the blue, an illustration of which we see almost daily in the sky.

It is a simple matter to match the brightness of like colors, but to match the brightness of blue against orange is difficult, and readings made by different observers often vary widely. This difficulty can be overcome in either of two ways: (*a*) by varying the current through the illuminometer lamp and therefore the temperature and color of the incandescent filament, or (*b*) by inserting colored light filters[5]

[4] Made by the Corning Glass Co., Corning, N. Y.

[5] We find a #16 orange-colored Wratten light filter satisfactory.

in the appropriate slot I, as shown in Figure 1. Figures 2, 3, and 4 show that either method of color correction gives good results, and that either may be applied to suspensions as different as acacia, silica, and tea in water, and zinc oxide in air. In all cases, it is important to standardize the Tyndallmeter by whichever method is to be used in the subsequent readings.

It is probable that the use of a single colored light filter for following the settling curve of an unstable suspension introduces errors, on account of the slight but gradual change in the wave length of the light from the Tyndall beam. A filter which is not "neutral" will have a different total light-absorbing power for different wave lengths. Where quantitative determinations are desired, errors due to these color changes can be avoided by plotting actual concentrations against Tyndall readings, and subsequently taking all determinations from the curves.

The Settling Rates of Dusts, Fumes, and Smokes

Tolman and his associates (7) showed that the rate at which a suspension such as rosin or tobacco smoke clears up in a confined space was markedly slower in still than in moving air. Whytlaw-Gray, Speakman, and Campbell (8) found that the particles of a suspenion like zinc or cadmium oxide actually grow in size when they are first formed. Both groups of investigators discovered that the rate at which their suspensions cleared up depended on the rate at which the particles coalesced or flocculated into units large enough to settle out. If the surface walls of the containing vessel or cabinet are small, a great deal of the clearing up will be due to diffusion of particles to the walls, and not due simply to flocculation and settling. To minimize these factors, we use a large cabinet, about 1,600 cubic feet, and reduce air currents as much as possible.

Suspensions of dusts are made by blowing dried powders into the cabinet by means of an ejector or suction tee; fumes, such as zinc oxide, are formed by blowing a gentle stream of oxygen through the boiling metal or a stream of carbon dioxide through zinc diethyl; tobacco and rosin smokes are made by blowing air through the appropriate substance, brought to the ignition temperature. No Tyndallmeter readings or quantitative determinations are taken until the air currents have subsided.

In Figures 5 and 6, the settling curves of several different smokes, fumes, and dusts are shown. In general, the comparative rates at which the Tyndall readings fall off give the comparative stability of the suspensions. Not only are they all different, but the same substance, zinc oxide, for example, suspended in the air by different methods gives different results. These differences, which are due entirely to differences in particle size and dispersion, are shown better in Figure 7, where Tyndall readings are plotted against concentration as obtained by electric precipitator (9) (10) (11). It will be noticed that both of the zinc oxide curves, and also the curve for rouge, flatten out in much the same way as does the curve for tea in Figure 2. This means that the point of saturation or opacity (at least with regard to

the reflection and scattering of light) is being approached. Further increases in concentration, therefore, give no appreciable increases in Tyndall reading.

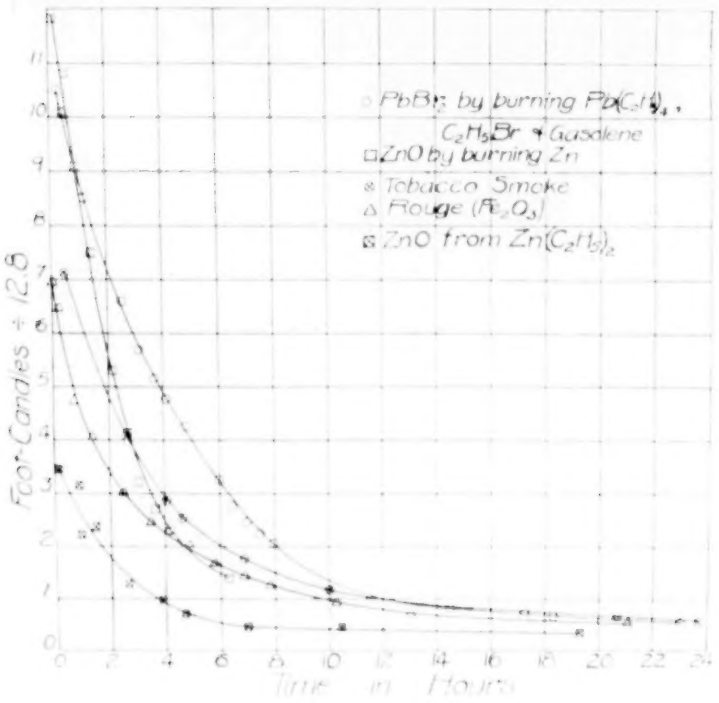

FIG. 5.—Settling curves of various suspensions in air of gas cabinet. Still-air conditions.

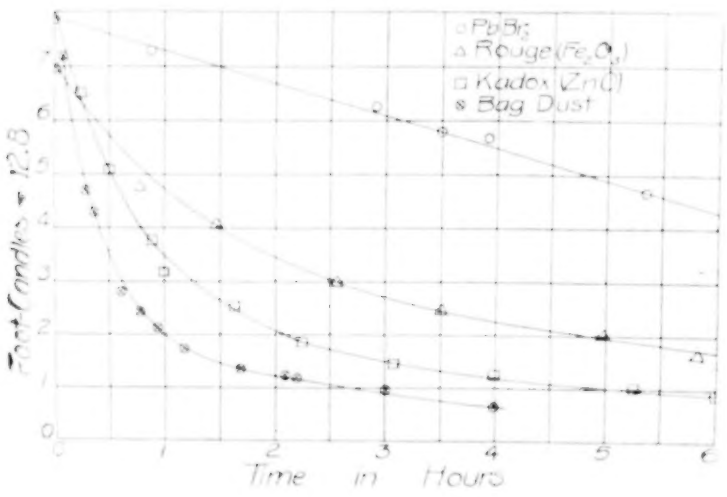

FIG. 6.—Settling curves of suspensions of varying stability.

MEASUREMENT BY TRANSMITTED LIGHT

Another photometric method of following the concentration of suspensions in air is by the intensity of light transmitted through a known distance from a known source of light. Results similar to those shown in Figures 4, 5, 6, and 7 can be obtained by projecting a powerful light through a known distance of suspension within the gas cabinet and reading, by photometer, the brightness of a test plate

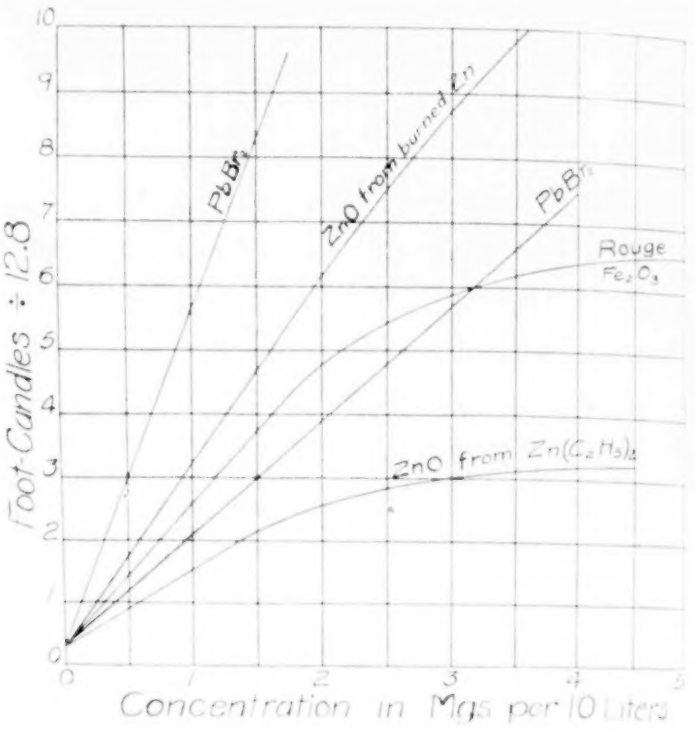

FIG. 7.—Curves showing relation of Tyndall readings to concentration as determined by electric precipitator. Note straight line relation of lead bromide and curvature of other lines. Difference between the two lead bromide lines due to changing lead tetra-ethyl mixture.

outside the further wall of the cabinet. This value varies inversely with the concentration, until the point of saturation or opacity is approached. Then the straight lines begin to curve, as in Figure 7, and the simple proportion no longer holds true.

CONTRAST PHOTOMETER METHOD

Owens and his associates (12) have developed a method which appears to be even more sensitive than those just described. It is an adaptation of Richardson's (13) method of measuring the amount of water in clouds. We quote from their description as follows:

The contrast photometer differs from other photometers in that it measures,

instead of the intrinsic brightness of a surface, the contrast between two adjacent surfaces, which is accomplished by observation of a real image projected on to a white screen by means of a suitable lens. An image of the boundary between the two surfaces to be compared is focussed on the screen, which is opaque, but with a translucent portion, arranged to coincide exactly with the image of the less bright object surface. Behind the screen a standard light is arranged and adjustment is made until the field appears uniform, when the lack of brightness of the fainter source is exactly compensated by the light passing through the translucent screen, which gives a measure of the contrast between the two sources.

Any extraneous light, such as that scattered and reflected by suspended matter in the air will add equally to the brightness of the two images and will not affect the reading of the instrument, provided that the extraneous light is well diffused and uniform over the field of observation.

The adjustment may be made by varying the standard illumination behind the screen, keeping the image of the source constant, or by adjusting the brightness of the image to balance a constant illumination of the translucent part of the screen. In actual practice the latter is preferable since it is more easily performed, and it ensures that on every occasion, when in adjustment, the brightness of the whole of the field of view is at a definite pre-arranged value, which eliminates any irregularity due to variation of the sensitiveness of the eye at different degrees of illumination.

This instrument, like the Tyndallmeter, can be used in daylight as well as at night. In using it, the searchlight is placed at a definite distance away (say 50 feet), and in all cases readings are converted into percentage obstruction, zero percentage indicating perfectly clean air.

In Figure 8, we have replotted two charts, the data for which were taken from the original paper of Owens and his associates (12). The three parallel lines show the relations between (*a*) light obstruction and number of particles per cubic centimeter and (*b*) light obstruction and weight of the particles per cubic meter. Approximate readings either for weights or for counts can be made directly from the solid line midway between the two dotted lines.

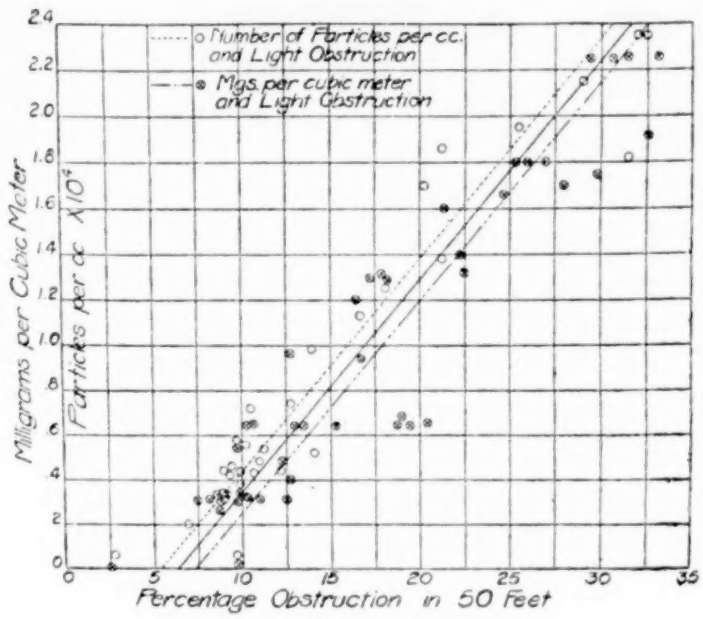

FIG. 8.—Chart adapted from those published by Owens and his associates (12) on the use of the contrast photometer for determining the obstruction of light by dust in air.

This chart reveals the error of assuming that dust and soot particles are suspended in the air in the same manner each day. We find that our Tyndallmeter errors from making this assumption are of the order of 10 to 20 per cent. Whether or not errors of this magnitude are important will depend on the use to which the data are put.

DISCUSSION OF PHOTOMETRIC METHODS

The Effect of Moisture

Hygroscopic nuclei, such as sodium chloride, sulphur trioxide, and ammonium chloride in air, cause fogs in

atmospheres well below the saturation point. Substances like zinc oxide and silica, on the contrary, have little or no fog-producing power until the saturation point is reached. Obviously the effect of moisture in the air on the reflecting power of the suspension which is to be examined photometrically must be known, or determinations, either by transmitted or by reflected light, have little quantitative significance.

The Effect of Particle Size, Concentration, and Dispersion

The concentration of the particles of any substance, dispersed either in a gas or in a liquid, varies as the number of particles per unit volume and the cube of their diameter. Tolman and his associates (7) apply this principle to Lord Rayleigh's theory that "for particles which are small compared with the wave length of light, we may expect the intensity of the Tyndall beam to be proportional to the number of particles, n, present per cc. and to the sixth power of their diameter, d^6." Large particles, however, reflect light in proportion to their number, n, and the square of their diameter, d^2. Expressing it in terms of an equation, Tyndall reading:

$T = kcd^3$ for very small particles
$T = k'c/d$ for large particles

where k and k' are constants, c is the concentration, and d is the diameter. This being true, the Tyndall beam will vary in intensity with the size and dispersion of the particles, which means that curves like those in Figure 7 are applicable, strictly speaking, only if the substance is introduced into the air in precisely the same way each time. This, of course, will rarely happen in practice.

In determining a fume like zinc oxide or sulphuric acid mist, the extent of error from assuming constant particle size and like dispersion can be judged in some degree by noting the change in the color of the light from the Tyndall beam.

A Portable Tyndallmeter

In the form in which we have shown it, this instrument is not portable. For use in field work, we should suggest substituting for the iron pipe either unpainted hard rubber or thin brass tubing, painted dead black inside, using Edison alkali batteries, which are very light, to supply current for the Tyndall lamp and current to run a small suction fan for pulling the sample of air or gas through the examining chamber.[6] A small ammeter and rheostat of the type used in radio equipment are satisfactory for controlling the current through the Tyndall lamp. The most expensive and delicate part of the apparatus is the Macbeth illuminometer. As yet we have found no cheaper substitute for this instrument.

Application of Photometric Methods

In the foregoing discussion, we have shown the accuracy and convenience of photometry in examining suspensions. A few examples of its application to problems of particulate inhalation will not be out of place.

[6] A suitable motor and fan, run from current supplied by a single Edison alkali cell, has been described by Drinker and Thomson (11).

From the curves in Figures 5, 6, and 7, we can predict with assurance that lead bromide fume would be well dispersed, that it would be composed of very small particles with little tendency to flocculate, and that it would therefore pass readily through any but the most efficient masks or respirators.

In an investigation now in progress, we find that relationships of this sort have direct value in determining the percentage of dust retained both by men and by animals on inhaling known concentrations. The percentage of dust retained varies with the rate and depth of breathing; it also varies with the size, concentration, and dispersion of the particles inhaled.

In Figure 2, we have shown the accuracy with which dilute concentrations of silica suspended in water can be estimated by Tyndallmeter. Aqueous suspensions of this dust are markedly unstable unless the particles are about 10 microns or less in size, precisely the range of hygienic interest. It would seem reasonable, therefore, to estimate with the Tyndallmeter silica from samples collected by any approved method. Tolman and his associates (6) have described fully a simple method for making silica suspensions of uniform particle size, with which the unknown can be compared and checked.

Conclusions

The primary advantage of photometric methods in field work is the rapidity with which readings are made and the subsequent reduction of work in the laboratory. Although these readings cannot always be converted into concentrations of the particular suspension, they give reliable indices of the size and dispersion of the particles.

Photometric methods may be applied to true colloids like acacia in water or tobacco smoke in air, as well as to coarse, unstable suspensions like silica dust in water or in air.

The chief disadvantages in using photometric methods are that the equipment, as we use it, is expensive, that it requires care and accuracy in use, and that it probably can never be reduced to the coat pocket size. Then, too, these methods cannot be applied indiscriminately to different suspensions, or even to the same substance suspended by different methods, unless the size, dispersion, and color of the particles are alike; and they cannot be applied with quantitative accuracy to suspensions in which the concentration of particles is approaching the region of opacity to light.

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BOOK REVIEW

Die deutsche Bleifarbenindustrie vom Standpunkt der Hygiene. Nach eigenen Untersuchungen 1921–1922. By *Prof. Dr. K. B. Lehmann*, Geh. Hofrat Direktor des Hygienischen Instituts Würzburg. Paper. Pp. 95. Berlin: Verlag von Julius Springer, 1925.

This is a record of investigations made personally by Prof. K. B. Lehmann of Würzburg concerning the hygienic conditions in the lead paint industry of Germany including white lead, paint grinding and the roasting of oxides to make red lead, and further, concerning the actual physical condition of men engaged in these trades, with special reference to the existence of lead poisoning. Lehmann undertook the study in co-operation with the manufacturers, but with the distinct understanding that he was to have entire freedom of inspection and the right to publish his results, whether favorable or unfavorable. His examinations covered 642 men of whom 376 were examined in 1921 and 266 in 1922.

A detailed description is given of the method of producing white lead in

Germany, where the so-called "chamber process" is commonly used, rarely the Old Dutch process of England and America. The first stage, casting strips, is like our first stage, but instead of burying the blue lead in heaps of tanbark, with acetic acid as we do, the Germans hang the strips on beams in a chamber and drive in vapors of water, acetic acid and carbon dioxide (produced in the Old Dutch process by the fermentation of the tanbark). The essential differences between the two processes come in after the chemical change, the "corrosion," has taken place and the metallic lead has been converted to the powdery white basic carbonate. In America, the pots filled with this must be dug out of the tanbark and emptied one by one into a truck and, with the best possible movable exhausts, this is always a dusty, dangerous job. In Germany, the white lead as it forms drops to the floor of the chamber and can be thoroughly moistened before it is shoveled out. If this is imperfectly done there may be some dust, but there is no reason why it should not be well wet down, for it goes at once into water, while in American plants it goes into a separator and must be kept dry. The advantages, so far as dust is concerned, are all on the German side.

The next place of danger is in emptying the dried white lead. This is unnecessary if so-called "pulp lead" is produced—that is, if the lead suspended in water is gradually added to oil in a paint grinder. Such lead is produced in large quantities here and in Europe and before the war German white lead paint was nine-tenths pulp lead, but now, since it is manufactured chiefly for export and the demand is for dry white lead, only four-tenths is ground as pulp. American white lead is dried in great, double-jacketed copper pans from which it is removed, in good plants, with such provision of covers and exhausts as quite to prevent dust, in primitive ones simply by shoveling and dumping. In Germany, as in England, the lead is dried in pots placed in ovens and is dumped by hand. According to Lehmann, all the processes can be carried on without the production of dust, but poor apparatus and carelessness result in more or less dust in many plants.

The oxides, red lead and litharge, are produced as they are here, and the description of a good German plant could be duplicated in this country. It is true also, here as there, that the sanitation of the oxide industry has not been carried to as high a point as has that of the white lead industry, partly because it is more difficult to control dust in the former. Lehmann did not find one oxide plant which he considered model.

The laws in Germany regulating these trades are strict and make poisoning by ingestion of lead from contaminated food or tobacco almost impossible, and the experiments of Süssmann in Lehmann's laboratory have shown that only insignificant amounts pass through the unbroken skin. Inhalation of dust is the way in which lead poisoning occurs, and Lehmann quotes A. S. Minot to the effect that absorption takes place even from the nasal mucosa. Dust is therefore the great danger to be guarded against, especially in the oxide plants, and the means of protec-

tion against lead poisoning consist in the use of water to dampen down; the use of dust-proof apparatus and of dust exhausts. Lehmann thinks that white lead factories should have tinted walls and ceilings, oxide factories, white ones, so as to make the dust as conspicuous as possible. Respirators should be provided, for emergency use, and carefully fitted. Most of those examined let fine white or red dust in, which showed on the man's face. All dry sweeping should be forbidden. Shop discipline is of great importance and word-of-mouth instruction of more use than printed instructions. Lehmann believes it is a great mistake to say that workmen are frightened away by warnings as to the danger of their work. Reckless disregard of danger is much more common. It is a pity that neither white lead nor the oxides have any irritating or disagreeable properties.

It is customary in Germany to provide clean working clothes weekly for all, oftener for the chamber strippers. Soap and brushes are also provided, and Lehmann satisfied himself by the ammonium sulphide test that no lead was adherent to the hands and arms of the men after washing. Chamber strippers must take a bath daily, others weekly. Smoking on the job is forbidden. Lehmann believes that mouth hygiene would be of great service in these industries.

The connection between lead poisoning and alcoholism is not clear. That drunkards suffer more from plumbism is known to all, but drunkards are careless, unteachable men. Good food is very important and Lehmann found a great craving for fats and milk among the men, but the investigation was made at a time of extreme food scarcity in Germany, especially during 1922.

Labor turnover in the white lead industry is six to ten times as great as the average for Germany, and Lehmann quotes Klebe, Legge, and Sternberg as finding an increase of plumbism with an increased turnover. Under present conditions in Germany there is very little shifting, men hold their positions usually if they can, but in lead work four times as many are taken on as there are places to fill. A certain amount of this is desirable, for the oversusceptible must be weeded out, and as yet there is no criterion by which such can be detected. It is well to reject the pale, weakly, "lymphatic," and also the alcoholics. Of course every factory has its show specimens—men who have worked many years, have taken no unusual precautions and yet are in perfect condition.

Various methods of estimating the amount of lead dust in the air were tried and the one found most feasible consisted in exposing for known periods pieces of cardboard covered with glazed black paper, then collecting and estimating the lead which accumulated on the surface. Lehmann estimated that an hourly deposit on a square meter of paper of not more than 5 mg. of red or white lead meant excellent conditions; 10 to 20 mg. was still satisfactory; 40 to 60, the highest permissible limit. As much as 300 mg. was sometimes found. From a few air analyses which were made it was found that 1 cubic meter of air contained from 0.3 to 3.8 mg. of lead, but the latter amount repre-

sented unusual contamination, not a steady condition.

To discover the amount absorbed by the men, analyses of feces were made and in 150 gm. of feces (which is Pettenkofer's normal daily excretion) an average of 0.63 mg. was found in nine persons. If allowance be made for the largely vegetable diet now consumed by German workmen, this figure would be raised to about 1 mg., but even this is, in Lehmann's opinion, a harmless quantity, although Brouardel considered it sufficient to cause plumbism if taken for months. Gaertner found, in his study of human beings, that 0.35 mg. daily was harmless; 4 to 7 mg. daily would cause plumbism after some months; and 60 to 70 mg., after three or four weeks. However, Lehmann says that susceptibility varies enormously and in some instances there seems to be an immunity to lead, as in eleven men whom he examined and who, though in lead work for two to twenty-seven years, were all in excellent health.

The examination made of the 642 men included the following details:

1. Appearance, excellent, or normal, or pale, yellowish.

2. Strength, *i.e.*, musculature, fat reserve, etc.

3. Hemoglobin (Tallqvist).

5. Albuminuria, trace or clearly positive.

6. Hematoporphyrinuria (only about one-fourth were tested).

7. Lead line, marked, or plain, or dubious, or absent.

8. Stippled red blood cells. Five smears were made from each man, were hardened five minutes in absolute alcohol, dried and taken to the laboratory where they were stained with alkaline methylene blue or borax-toluidine blue, in such a way that the corpuscles showed a pale greenish blue. He estimates that about 200 reds are in an ordinary microscopic field and if one or more stippled cells are found in each field or a few in every third field, it is not necessary to count to determine that such a blood is positive.

9. Loss of extensor power in the wrist, as shown by an attempt to bend back the hand as far as possible, at the same time extending the fingers.

10. Questioning as to a history of colicky pains, headache, loss of appetite. Naturally some men tried to hide illness, for fear of losing their jobs; others exaggerated, from desire to make themselves interesting.

Lehmann accepts as normal anything under 200 stippled cells in a million; hemoglobin down to 80 per cent.; blood pressure, systolic, of 100 plus the year of age; no trace of albumin in the urine; not more than a trace of lead line; and no loss of power in the wrists.

The evaluation of the separate signs of plumbism is difficult, for individuals vary so much. Lehmann considers them in the order of their frequency, which brings stippling of the red cells in the first place. Of the men examined in 1921, 55 per cent. had as many as 250 per million, and of those examined in 1922, 58 per cent. Of these, some 3 to 5 per cent. had over 5,000 per million. So low a figure as 250 he looks upon as a warning only, and even higher counts seem to have little connection with the actual state of health

of the individual. Many observers have noticed that in severe plumbism the stippled cells disappear, and Lehmann has seen this in animal experiments. Such forms of lead poisoning are not seen in industry, but since in animals there may be periods of three to fourteen days when no stippling appears, it would be interesting to know if the same thing were true of men. Certainly a single negative examination means nothing. A second examination, made somewhat later, may give quite other results. Thus in one factory a second blood test was made on seventeen lead workers, four weeks after the first. Two had the same number of stippled cells as before; eight had an increased count, six of them markedly so; seven had a lower count, of whom three had only a few such cells and one, none at all. Nevertheless, in practice, several negative slides would be ground for holding a diagnosis of plumbism doubtful, provided there were no other strong basis for it.

Many control blood smears were made and confirmed the fact that, except in severe anemia, cancer, or malaria, stippled cells above 200 to the million are not found. Even the anemia from hemorrhage during parturition or abortion (twenty cases) yielded no typical stippling, although plenty of polychromatophilia.

Estimations of hemoglobin in 1921 showed that 22 per cent. were between 70 and 75 per cent., and 12 per cent. were 65 per cent. or lower. For 1922 the figures were 30 per cent. and 5 per cent., respectively. The lead line is a valuable sign of lead absorption, not of lead poisoning. It may appear early, especially in men with pyorrhea, and Lehmann has no doubt that the excretion of lead sets up a mild inflammation in originally healthy gums, as does mercury in much greater degree. Twenty-five per cent. and 26.7 per cent. of all examined (in the two years, respectively) had a slight lead line, 15 per cent. and 6 per cent., a plain line, and 5 per cent. and 0.3 per cent., a marked one.

In 1921, 318 specimens of urine were examined and in fifteen albumin was found, only a trace in nine, more in six. For 1922, the number examined was 256, with twenty positive. This is really under the average rather than above, for Leube found 16 per cent. of the young recruits with traces of albumin, and these lead workers were older.

Among 114 men fourteen were found with a pathologic amount of hematoporphyrin in the urine; in another group eight out of 73, which was about the same proportion, 11 to 12 per cent. Hematoporphyrinuria was twice as frequent in men with stippled cells as in those without.

Forty-two out of 376 and thirty-one out of 266 gave a history of gastro-intestinal disturbance of some kind, in forty-eight of which the diagnosis of lead colic seemed clear.

Lehmann was surprised to find not one case of true lead palsy, although French and English observers report this form of plumbism fairly frequently. In his second year he paid special attention to weakness of the wrist, because of Teleky's insistence on the importance of this as an early sign of poisoning. He found among the 266 men thirty-one who complained of weakness, but in only thirteen could a loss of extensor

power be demonstrated, and in these it was slight. The other eighteen seemed to have a stiffness of the tendons, such as follows heavy work or rheumatism. In none was the working capacity at all affected. As for the point made by Teleky, that the right hand of a lead worker shows less extensor power than the left, Lehmann found that it is also true of non-lead workers, especially those who have done heavy work.

Headache was a complaint in only 4 per cent. of the first group, and probably 10 per cent. of the second; this is no greater proportion than in the population at large, especially in view of the great food shortage in the second year. Arthralgia was also surprisingly absent, and as for the fine tremor on which Naegeli lays so much stress, Lehmann is unwilling to say anything positive, not feeling that he could distinguish a lead tremor from one caused by excitement, embarrassment, fear, age, hunger, exhaustion, alcohol, tobacco, or some nervous disease. A clearly defined tremor was certainly rare.

It is necessary to consider a combination of symptoms in deciding how many of these men showed evidence of plumbism. Lehmann took six signs —stippled red cells, lead line, loss of hemoglobin, increased blood pressure, albumin, and weakness of the wrists— and found that the two groups had about the same proportion of positive findings. Of the 376 men, 31 per cent. had one sign only, and of the 266, 31 per cent.; two lead symptoms occurred in 33 per cent. and in 29 per cent.; three in 12.5 per cent. and in 13.1 per cent.; and five in 2.5 per cent. and in 3.4. The most frequent single sign was stippling, next to that, low hemoglobin, then a lead line, and much the commonest combination was stippling and a lead line, to which might be added a low hemoglobin, and, in the last class, these three, together with heightened blood pressure and a trace of albumin in the urine or a weakness of the wrist extensors.

Lehmann discusses at some length the puzzling question of diagnosis. He classes as normal, men with no signs at all and those with one sign but with normal red blood cells. As highly suspicious cases, or as cases of mild intoxication, he classes those with stippled red cells and from two to five additional signs or symptoms. Between these there is a group of "suspicious" cases, including those with stippling and only one other sign. This last class should be under observation and, if there is any increase in the signs of plumbism, should be removed to other work, while the third class should at once be removed, temporarily or permanently, from exposure to lead. His two groups were divided between the three classes as follows: normal, 49 per cent.; suspicious, 35 per cent.; slight plumbism, 16 per cent.

The age groups seem surprising to an American reader. No less than 20 per cent. were between 50 and 60 years of age, and 5 per cent. over 60 years. As would be expected, the older men had a higher proportion of defects but length of service and signs of plumbism do not go hand in hand, for the men who stay in the trade are the least susceptible ones. The same thing appeared in the blood examinations, 38 per cent. of the

newly employed showing stippling, only 7 per cent. of those employed more than ten years. This means either that lead is less damaging to the bone marrow later in life or that the men with damaged marrow leave the trade.

Signs of intoxication developed quickly in some men. Thus Lehmann found one man, of 30 years, who, after one month's employment in oxide roasting and packing, showed 2,750 stippled red cells to a million, hemoglobin 70 per cent., pallor, and a slight lead line. Another, of 43 years, after two months' exposure, had 6,500 stippled cells, a plain lead line, and a trace of albumin and hematoporphyrin in the urine.

The reasons for the great improvement in the white lead and oxide industry in Germany are to be found in better construction of plants, removal of dust by exhaust, provisions for bodily cleanliness; and in the better selection of workmen, steady men instead of casual labor, the weeding out of oversusceptibles by the physician; in the shortened workday; the lessening of alcoholism; the stricter oversight on the part of the state; and the better education of the workmen.

Nevertheless, statistics from the Sickness Insurance Office show that lead workers have more than the average of days lost on account of illness. In one white lead works, the men in actual lead work averaged 14.4 days lost in the year, those in paint grinding, only 7.4, the zinc white men, 8.4. The average for all insured in the Leipzig office was 8.6. This increase is mainly due to the high rate of gastro-intestinal disease among the lead men. On the whole, white and red lead men, with a fairly low accident rate, have as many lost days as the men in the dangerous trades, building, stone cutting, mining, with their high accident rate.—*Alice Hamilton.*

SUBJECT INDEX TO VOLUME VII

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ABSTRACT OF THE LITERATURE

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SUPPLEMENTARY TO

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DAVID L. EDSALL, M. D., S. D., United States
EDGAR L. COLLIS, M. D., M. R. C. S., Great Britain

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ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

VOLUME VII JANUARY, 1925 NUMBER 1

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GENERAL

INDUSTRIAL HYGIENE. *T. Oliver. Jour. State Med., July, 1924, vol. 32, pp. 334–339.*

This paper was the presidential address read at the meeting of the Industrial Hygiene Section of the Bordeaux Congress.

Shorter Hours of Labor.—It was shortly after the commencement of the last century that the first organized attempts were made in England to shorten the hours of labor. In France, similar events followed soon afterward.

Preventive medicine is the medicine of the present and the future. It is wiser to try to prevent illness arising in the course of employment, also accidents occurring at work, than to wait until either of these possibilities arises.

Phosphorus Poisoning in Match Factories.—When the Home Office initiated an investigation in England as to illness of workers in lucifer match factories, France prosecuted a keen inquiry into the chemical side of the problem. It was a French chemist who discovered that sesquisulphide of phosphorus might be employed as a safe substitute for the toxic white phosphorus.

Employment of Women.—In the United States of America there were a short while ago 8,500,000 earning their living in commerce and industry. The secretary of labor, Mr. James J. Davis,

at a recent conference of industrial women workers in Washington, told the audience that one-fifth of the women of the United States are workers earning their daily bread, and that one-tenth of the married women are similarly occupied. When a working-man finishes his task for the day, he is free to spend the evening as he chooses, but when a married woman leaves the factory, she, unfortunately, must too frequently look after the affairs of the home and attend to the children. How to harmonize the work of women in industry with work in the home is the difficulty. Many efforts have been made by means of hostels to provide a shelter and a degree of comfort for unmarried working-women, and since some of these homes have been successful and have met a real need, the system might be extended, so long as the hostels are conducted with that kindly and thoughtful consideration of the tastes and desires of the residents who are influenced by present-day social customs.

Employment of Disabled Workmen.—Work of a graduated character should be provided for working-men and working-women who are slowly regaining their health after an illness, or who perhaps have not completely recovered from the effects of injury. Half-day work and temporary light employment, with wages corresponding to services rendered, do not find favor with labor unions; but in the motor works in Detroit such arrangements are being carried out amicably, and an experiment is in progress whereby it can be shown that no individual, except one so seriously ill that it is useless to raise the question, is, through age or the effects of illness, thrown upon the scrap heap and his services lost to the cause of labor.—D. A. C.

INDUSTRIAL HYGIENE. *T. M. Legge. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 205–210.*

The progress of industrial legislation in Great Britain is summarized as a first period concerned with excessively long hours worked by children, a second period when accident prevention and industrial diseases were prominent, and a third—the present period—in which the physiology and psychology of the worker is being investigated. Experience has shown that, in relation to preventing disease, where you can bring an influence to bear which is external to the worker, success follows; but that, if you have to rely on something the worker has to do, nothing is attained. The office of certifying surgeon, and its comparative failure, is discussed; detailed medical examination of applicants for work, reexamination as required, periodic examinations in dangerous processes, and medical supervision of first-aid equipment, are advocated.—E. L. C.

WHY ARE FACTORIES CLOSED TO THE MEDICAL OFFICER OF HEALTH? *F. E. Fremantle. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 211–221.*

The importance of industrial hygiene to the health of the community is stressed. Control by the British Home Office, isolated from the Ministry of Health, is deprecated, and a consolidated health service is demanded; the present control arose out of historical chance and should be discontinued. The enforcement of factory law by a staff of 200 expert

engineers and chemists, assisted by only four doctors, is held to be wrong, since factory law is part and parcel of the public health code. Local health authorities should exert health functions in local factories and co-ordinate the work with their other duties, such as tuberculosis prevention and school medical service; the whole being advised and supervised by the Ministry of Health.—E. L. C.

THE MUNICIPAL HEALTH DEPARTMENT: ITS RELATION TO INDUSTRY AND INDUSTRIAL WELFARE. *G. C. Trotter. Jour. State Med., Sept., 1924, vol. 32, pp. 401–406.*

The author is medical officer of health for the Metropolitan Borough of Islington; he points out that in England local health authorities exert some, but not sufficient, influence over industrial establishments within their area. Plans of new buildings must be submitted to them for approval and sanitary accommodation is partially under their control. Meanwhile factory medical service, directed from the Home Office, is inadequate and insufficient. The local authorities can do much, particularly with regard to the recreational side of industrial welfare. An *entente cordiale* is needed between the municipal workshop inspector, school medical service, factory surgeons, and inspectors of factories.—E. L. C.

THE VALUES FOR WHICH THE INSTITUTION OF MINING ENGINEERS STANDS. *J. S. Haldane. Abstract of Presidential Address Read at Annual General Meeting of the Institution of Mining Engineers, London, Oct., 1924.*

Medicine and physiology have been paid a great compliment in the election of Professor Haldane to the presidency of the Institution of Mining Engineers. For thirty years he has been engaged in the investigation of physiologic problems concerning the safety and health of the miner. His work on the causes of death in colliery explosions, on the prevention of colliery explosions, on the analysis of mine air, on problems of ventilation, of rescue work and of the industrial diseases of miners is of world-wide importance.

Perhaps the most pleasing part of Professor Haldane's address was what he afterwards described as his sermon on comradeship and the necessity of personal contact between employer and employee. Professor Haldane said:

> Our *Transactions* are, however, distinguished from those of other professional associations by the fact that questions concerning the safety and health of those engaged in the industry we represent bulk very largely in them. The reason for this is that in mining work dangers of one sort or another are constantly at hand. It is only through accurate knowledge, skill, and constant care for another's safety, that those engaged in mining can keep the dangers at bay. . . . . The collieries of this country would be quite different places from what they are but for the presence in them of a comradeship capable of dominating all other considerations. I have often been present at a colliery during some time of trouble or danger; and it was this comradeship, from highest to lowest, that impressed me most.
>
> Comradeship is just action based on the placing of value upon the interests of neighbours. It carries with it respect, and the very highest kind of respect, for those who show it, whether they be rich or poor, known or unknown. It is comradeship that inspires, and has made, our Institution; comradeship not merely between its

members, but also between them and all engaged in the mining industry. It seems to me that among the values for which this Institution stands those which are embodied in what may be called comradeship are the most important, and in reality embrace the rest.

It is not with scientific abstractions called "Labour" and "Capital" that British mining engineers have to work, but with their own fellow-countrymen, their own flesh and blood. These fellow-countrymen will give loyal and efficient service, will face any danger, will forgive imagined or real mistakes, and will take the rough with the smooth, the bad times with the good; but what they will not tolerate is being treated as if they were mere tools, to be cast aside without compunction.

Professor Haldane dealt with the relationship between labor and capital, and stated that the real driving power behind what is called labor unrest is just human rebellion against what are regarded as inhuman relations. He said:

> My own work in pure science can be summed up in the conclusion that the mechanical conceptions of physical science break down irretrievably when we endeavour to apply them to life and conscious behaviour, both of which are a part of what we call Nature. We cannot in the long run dispense with the spiritual conception of Nature; and I have just tried to point out that the mere economic conception of industrial life breaks down equally hopelessly when we try to apply it to such an industrial undertaking as a British coal mine.

—T. L. L.

INDUSTRIAL INSPECTION IN AUSTRIA IN 1922. *Internat. Labour Rev., Oct., 1924, vol. 10, pp. 674–685.*

Bad trade, unemployment, and lack of capital are the distinguishing notes. The expert inspectorial staff, 67 in all, was too small to compass its duties. Women constituted 26.3 per cent. of those employed in establishments visited, and young persons between 14 and 16 years of age, 4.6 per cent. A general lack of apprenticeship is deplored. The eight-hour day was fairly observed. Building costs stood in the way of needed alterations; hence untidy, ill-kept, and even dangerous conditions could not always be remedied; the expense of ventilating apparatus was prohibitive; even the cost of driving artificial exhausts in some cases led to their stoppage. Progress in hygiene and welfare was suspended. A few cases of occupational diseases came under notice, such as brass founders' ague, skin affections, and aniline poisoning.—E. L. C.

THE SIGNIFICANCE OF OCCUPATIONAL DISEASE. *F. Curschmann. Zentralbl. f. Gewerbehyg., July, 1924, N. S. vol. 1, pp. 2–5.*

The laity often associate certain diseases with their work. A disease cannot be called an occupational one, even if it occurs frequently in a trade, unless it has been proved that it is caused by the practice of the occupation. Pulmonary tuberculosis occurs frequently among tailors, not because the trade predisposes to tuberculosis but because weaker, less resistant men enter that trade.

A man suffering from chronic pulmonary disease may be made worse by irritating fumes; this is not, however, an occupational disease. If the fumes lower the resistance so that a formerly healthy worker becomes ill, the disease may be considered occupational.

According to German law it is very important to distinguish between accident while working and occupa-

tional disease. An accident need only be suffered during work without any direct connection with it—*e.g.*, a worker hit by a stray bullet. An occupational disease is one due to repeated injuries and occurs with a definite regularity in a trade. It is not caused by any other subjectively or objectively recognizable bodily injury.—H. E. H.

INDUSTRIAL DISEASES. RAPID REFERENCE MANUAL. *C. T. Graham-Rogers. N. Y. State Dept. Labor, Div. Indust. Hyg., 1924, pp. 45.*

The contents of this pamphlet are of two kinds: (1) legislation concerning industrial diseases; and (2) causes and classification of occupational diseases. Included under legislation are the reporting law and the purpose of reporting, extracts from the Workmen's Compensation Law, and fees for medical services in compensation cases. The rest of the manual contains a list of the diseases of occupation, classified according to injury and hazard, and also a list of harmful substances and their effects. An alphabetical index of industries concludes the book.—B. L. G.

RURAL AND URBAN HEALTH. A COMPARISON OF PHYSICAL DEFECTS IN UNIVERSITY STUDENTS FROM RURAL AND URBAN DISTRICTS. *W. P. Shepard and H. S. Diehl. Jour. Am. Med. Assn., Oct. 11, 1924, vol. 83, pp. 1117–1123.*

When examined for the purpose of detecting departures from normal, students entering the University of Minnesota show the following:

1. Students raised in villages of from fifty to 1,000 population have more physical defects than students raised in other communities. Multiple defects are also common in this group.

2. Students raised on farms show more physical defects than those raised in towns or large cities, about the same number as those from small cities, and less than those raised in villages.

3. Students raised in towns of from 1,000 to 5,000 population show less physical defects than any others except those from large cities.

4. Students raised in small cities of from 5,000 to 50,000 population are exceeded in total physical defects only by students from villages.

5. Students raised in cities of more than 50,000 population show the lowest number of physical defects.—K. R. D.

TIN-PLATE MANUFACTURE. *Travelers Standard, May, 1924, vol. 12, pp. 105–110.*

This article deals with the intricacies of tin-plate manufacture and its hazards. In heating furnaces of the older types there is danger of exposure to radiant heat and glare. Goggles with lenses of a protective color are recommended. There is also danger of burns from bars of steel which may look cool but still retain enough heat to cause serious burns. There is danger that acid solutions used in the pickling processes may get into the eyes and mouth and here also it is advisable for the men to wear goggles. The fumes and vapors from the pickling plants are harmful and inhalation of them may give rise to bronchitis, rhinitis, pneumonia, and other respiratory troubles, to gastritis, anemia, erosion of the teeth, and ulcers of the nose and mouth. There is also

the possibility of poisoning from acids which are not chemically pure.

There is considerable hazard in the handling of acid, and safety measures should be instituted to prevent accidents. Goggles, rubber gloves, and wooden-soled shoes should always be worn by the men when working with strong acid.

In the tinning operation there are several hazards. The fumes from molten metal are dangerous, but more so when lead is mixed with the tin. These hazards can be taken care of by an efficient and powerful exhaust system of ventilation. There is also danger of serious burns when hot metal is spilled or spattered on the workmen.—H. B. E.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

Epithelioma of Scrotum in Cotton-Spinners: Is There a Precancerous Stage? *A. Cochrane. Brit. Med. Jour., Nov. 1, 1924, vol. 2, p. 835.*

A case in a cotton-spinner is recorded of a small wart on the scrotum with ulceration at the base. After excision the pathologic report pronounced the condition one of chronic inflammation with no evidence of malignancy. The author states that cases of scrotal cancer seen by him usually give a long history extending over years. He asks whether there may not be a definite premalignant stage in these cases.—E. L. C.

Sudden Death from Echinococcus Cyst of Liver Following Trivial Injury. *D. S. O'Connor. Jour. Am. Med. Assn., Sept. 27, 1924, vol. 83, pp. 999–1000.*

A young Italian employed as the driver of an electric truck in a large factory failed to stop his truck when driving at about 5 miles an hour and was struck in the upper abdomen by a box projecting from a tier of boxes. Almost immediately he vomited, collapsed, and died. Autopsy disclosed a large unruptured echinococcus cyst of the liver, the presence of which had not been suspected during life. The author believes death to have been due probably to direct pressure on the vagus nerve, causing inhibition and resultant stoppage of the heart.—K. R. D.

CIRCULATORY SYSTEM

Stair Climbing as a Test of Cardiac Function. *J. H. Wallace. Abstr. as follows from Am. Jour. Dis. Child., Sept., 1924, vol. 28, p. 282, in Jour. Am. Med. Assn., Oct. 11, 1924, vol. 83, p. 1195.*

Ten children recommended, on the basis of history and physical examination, as having chronic heart disease with slightly diminished exercise tolerance performed the activities of normal childhood easily and without evident physical detriment. Rather strenuous stair climbing was performed by this group easily and without evidence of cardiac embarrassment. A study made by Wallace of the blood

pressure reaction changes after a given piece of work revealed that in children with mild heart disease the reaction time is usually longer than in children with normal hearts, and that it is longer still in children with more severely damaged hearts, especially in cases of mitral stenosis. The blood pressure and pulse rate reaction times following a given work test were recorded before the beginning of a period of supervised rest, play and work, and again from three to four weeks later. Although the subjects showed obvious general improvement, a comparison of the two sets of reaction periods showed a tendency toward increasing, rather than decreasing, blood pressure and pulse rate reaction periods.—K. R. D.

ANEURYSM OF THE RADIAL ARTERY. *J. A. Cahill. Jour. Am. Med. Assn., Sept. 27, 1924, vol. 83, p. 1000.*

A laundry helper at the Bureau of Printing and Engraving, while in pursuit of his usual occupation in the laundry, was sewing heavy rags with a large caliber needle. While sewing, he jammed his left wrist just above the joint and on the radial side of the flexor surface with the needle. An aneurysm of the radial artery developed subsequently. This caused so much pain and throbbing that it was excised, the artery being tied above and below the sac. The wound healed by primary union, with no resulting circulatory or nerve disturbance in the hand.—K. R. D.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

OCCUPATIONAL ACCIDENTS AND INDUSTRIAL DISEASES. *G. Wolff. Abstr. as follows from Tech. Ind. Schweiz. Chem.-Ztg., 1923, pp. 13–18, in Chem. Abstr., Oct. 10, 1924, vol. 18, p. 3091.*

This is a general discussion of industrial hazards in the chemical trades.—P. D.

ACTION OF BENZINE ON ANIMAL AND ON MAN. *Il Lavoro, Sept., 1924, vol. 15, pp. 280–281.*

Reference is made to the work of N. P. Krafkoff and J. L. Okumiewscki and to their conclusions:

1. Benzine (Russian) is the same as other light benzines.

2. It acts chiefly on the central nervous system and the respiratory system, causing paralysis and irritation of the mucous membranes.

3. On account of its effect on the respiratory system, it is not beneficial to tuberculosis, as was supposed.

4. It has no special effect on cardiovascular activity.

5. Its effect on the blood has not yet been sufficiently studied, but it seems to produce anemia.

6. The amount tolerated in air is 0.5 up to 2 mg. per liter of air.

7. Ten to 20 mg. per liter may produce harmful effects.

8. Twenty milligrams and over can produce toxic accidents.

9. Five-tenths of a milligram per liter is the safety limit for calculating ventilation.

10. There exists a special sensitivity to benzine.

11. On account of inequality of distribution, vapors should be removed at the source.

12. Other odorous substances, although chemically inert, should be removed.

The authors report the case of a patient without symptoms or other signs of poisoning who was found to have forty-two stippled cells per hundred leukocytes after three and one-half months' work with red lead. After a further month and a half he had become pale but showed no lead line or colic. His blood showed then seventy stippled cells and ten nucleated red cells per hundred white corpuscles. This patient died in a few weeks.—J. W. S. B.

BLINDNESS CAUSED BY INHALATION OF COAL GASES: RECOVERY. *G. Fejér. Am. Jour. Ophth., July, 1924, vol. 7, pp. 522–523.*

This type of blindness is not often met because severe cases are mostly lethal. Coal gas contains carbon monoxide, carbon dioxide, and methane, and their affinity for hemoglobin is 200 times greater than that of oxygen.

The patient reported, a stoker, aged 62 years, fell into a tank of coal gases and was rescued a few minutes later in an unconscious condition. He remained in a hospital for four days and complained of disordered vision. His eyesight continued gradually worse for seven days. Objective investigations did not show any abnormalities. Potassium iodide was prescribed. Vision improved gradually and after two weeks he could count fingers with the right eye from a distance of 2 meters, with the left eye from 5 meters; the field of vision was narrowed concentrically. After another ten days the vision of both eyes rose to 5/5, and at the final examination was almost normal.

In only one case recorded in literature do we find total blindness, which continued for eight days, and bilateral hemianopsia, which continued during several months. Purtscher, who recorded the case, believed that a hemorrhage or softening either of the visual radiations or of the cortex itself caused bilateral blindness and hemianopsia.

Recovery in the case of the stoker is explained on the basis that the hemorrhage has been absorbed or that the disordered circulation in the cortex has been righted.—B. L. G.

CARBON MONOXIDE POISONING. *R. C. Affleck. Brit. Med. Jour., Oct. 11, 1924, vol. 2, p. 690.*

A case is reported of suicidal impulse attributed to fumes from a flueless gas stove in an office. The author considers that bakers at the work must experience ill effects from this gas.—E. L. C.

TREATMENT OF CARBON MONOXIDE POISONING. *D. I. Macht and S. S. Blackman, Jr. Abstr. as follows from Jour. Pharmacol., 1924, vol. 23, p. 142 (Proc.), in Chem. Abstr., Oct. 20, 1924, vol. 18, p. 3228.*

Ultraviolet rays cause the dissociation of carbon monoxide hemoglobin. Animals, poisoned with carbon monoxide and exposed to ultraviolet rays, recovered much more quickly than similar animals poisoned to the same degree but kept at the same temperature in the dark. Temperature has some influence in the reaction but the rays play the greater rôle.—P. D.

LOBELIN IN CARBON MONOXID POISONING. *Behrens and Pulewka. Abstr. as follows from Klin. Wchnschr., Sept. 9, 1924, vol. 3, p. 1677, in Jour. Am. Med. Assn., Oct. 11, 1924, vol. 83, p. 1208.*

Behrens and Pulewka poisoned cats with carbon monoxide until the respiratory center was paralyzed. After this they injected lobeline, and observed a return of respiration.—K. R. D.

HYDROFLUORIC ACID FUMES. *C. M. Salls. Indust. Hyg. Bull., Sept., 1924, vol. 1, p. 10.*

Exposure to hydrofluoric acid fumes produces intense irritation of the eyelids and conjunctiva, coryza, bronchial catarrh, and ulceration of the nostrils, gums, and oral mucous membrane; also painful blisters and ulcers of the cuticle, suppuration under and loss of the finger nails.

This acid is used to produce etchings on fancy glass containers, in the manufacture of pottery, glassware, and fertilizer, and for the bleaching of cane for chair seats. To produce etching, glass is dipped in a mixture of hydrofluoric acid and alkali fluoride and other salts. If the solution contains too much hydrofluoric acid the etching is coarse-grained and irregular, and if it contains too little of the acid the etching is transparent. The concentration of the acid, however, has nothing to do with the degree of opacity, for the neutral components enter into the reaction in some manner. Safe and sane mixtures for etching can thus be made by reducing the concentration of hydrofluoric acid and increasing the percentage of neutral components.—B. L. G.

FATAL CORROSION OF LARYNX FROM FUMES IN SOLDERING. *F. Koelsch. München. med. Wchnschr., May 30, 1924, vol. 71, pp. 718–719.*

A man who had been working, partly in a closed room, with copper and zinc solders (zinc chloride had been used as the solvent for the metals) noticed symptoms of malaise, headache, chill, and pain on swallowing.

Physical examination revealed reddening and loosening of the mucous membrane of the mouth and throat. The course of the disease was fairly rapid. The mucous membrane became dry and leathery and soon began to give off purulent shreds. It became impossible for the patient to swallow and rectal feeding was resorted to. On the tenth day a carbuncle formed on the chin. The patient died on the thirteenth day with all signs of sepsis. This diagnosis was confirmed on autopsy.

Usually the cases are not so severe. The exciting cause is thought to be the combination of the fumes of zinc chloride with the proteins of the mucous membrane.

It is recommended that such soldering be done in the open air or at least in well ventilated rooms. An alkaline gargle should be used as an additional precaution.—H. E. H.

THE PROTECTION OF THE NASAL SEPTUM FROM CORROSIVE ACTION OF INHALED CHROMATES. *Gerbis. Zentralbl. f. Gewerbehyg., July, 1924, N. S. vol. 1, pp. 10–11.*

Often the nasal septum is attacked without any symptoms; occasionally pain, pus, and hemorrhage occur. The disease usually starts at the rudimentary Jacobson's organ where the poorly

resistant cubical epithelium covers cartilages which have no blood vessels. The inspired air encounters this surface. The particles are caught on the mucous membrane and begin their corrosive action. First a serum appears on the septum, to be followed by a scab. This scab contains the particles of chromate which may erode not only the cartilage but also the bone.

The method of treatment is as follows: Twice a day the scab is rubbed off with an applicator around which is wrapped cotton moistened with dilute acetic acid. The purpose is to produce a resistant scar tissue. Although the treatment may be painful at first and may even produce hemorrhages, once the scar is formed the worker may breathe the chromate with impunity.—H. E. H.

THE PREVALENCE AND DISTRIBUTION OF INDUSTRIAL LEAD POISONING. *A. Hamilton. Jour. Am. Med. Assn., Aug. 23, 1924, vol. 83, pp. 583–588.*

Industrial conditions in the lead trades have been greatly improved in the last fourteen years, but there is room for further improvement in some plants. The actual prevalence of the disease is not known because cases are not reported.

Industries with a lead hazard are discussed, particularly the painters' and printers' trades. The forms of plumbism differ in different industries and are partly dependent on the severity of the exposure. In twelve years 131 cases of lead encephalopathy have come to the author's notice, and all of these followed exposure to lead dust or fumes. The effective prevention of lead poisoning lies in purification of the air which the workman breathes rather than in correction of his personal habits. The disease is far more important than many of our common infectious diseases, and it deserves far more interest devoted to its detection, diagnosis, and prevention.—J. C. A.

LEAD POISONING: ITS SYMPTOMATOLOGY AND DIAGNOSIS. *M. D. Shie. Jour. Am. Med. Assn., Aug. 23, 1924, vol. 83, pp. 580–583.*

This is a clinical paper discussing the signs, symptoms, and differential diagnosis of lead poisoning. Three case reports show the possibility of sudden onset of severe symptoms without warning, and three other cases are quoted to illustrate the symptom complexes found in the disease. Personal idiosyncrasy plays a large part in the development and the type of the lead poisoning. Acute lead poisoning is characterized by marked symptoms occurring after only brief exposure, while chronic lead poisoning develops slowly. This is a preventable disease and an early diagnosis is, therefore, very important. The greatest aid in diagnosis is a history of exposure. Valuable time should not be lost in waiting for objective signs to appear, when suggestive symptoms are present.—J. C. A.

LEAD STUDIES. IV. BLOOD CHANGES IN LEAD POISONING IN RABBITS; STIPPLED CELLS. *J. A. Key. Abstr. as follows from Am. Jour. Physiol., Sept., 1924, vol. 70, p. 86, in Jour. Am. Med. Assn., Nov. 1, 1924, vol. 83, p. 1456.*

Experimental lead poisoning in rabbits is consistently followed by the

appearance of stippled cells in the blood. These are not found in chickens or cats. Far more stippled cells appear in the blood of anemic than of normal rabbits after ingestion of lead. The stippled cell is a young red cell. Key asserts that the anemia of lead poisoning is due to actual rapid destruction of red cells in the blood stream and not to inhibition of the activity of bone marrow. Young red cells are destroyed more rapidly than mature cells. Leukocytosis occurs during experimental acute lead poisoning.—K. R. D.

BLOOD EXAMINATION IN LEAD POISONING. *Feil and Heim. Abstr. as follows from Paris méd., Sept. 27, 1924, p. 241, in Jour. Am. Med. Assn., Nov. 1, 1924, vol. 83, p. 1462.*

Feil and Heim report a case of lead poisoning with a fatal issue. While there had been no clinical manifestations of plumbism, intense changes in the blood had been noted early, and they continued a progressive course. The increase in the erythrocytes with basophilic stippling was proportional to the duration of the plumbism. Nucleated erythrocytes were present in the more advanced phases of the poisoning. Lymphocytosis occurred in the beginning, and disappeared afterward. The man was in the habit of baking potatoes for his lunch in the oven in which the minium was dehydrated. The whole course to the terminal pneumonia was only a few months.—K. R. D.

THE BASOPHILIC AGGREGATION TEST IN LEAD POISONING. *C. P. McCord, D. K. Minster, and M. Rehm. Jour. Am. Med. Assn., May 31, 1924, vol. 82, pp. 1759–1763.*

A method is described which demonstrates punctate granules in hemolyzed cells. The preparation is made by hemolyzing and staining the unfixed blood smear by means of a very dilute aqueous solution of Manson's methylene blue. Most bloods contain a few cells which show these "basophilic aggregations," but any blood with many reticulated cells shows an increased number. The blood in lead intoxication shows them in markedly increased numbers, and the authors use this method as an early index of lead intoxication. The increase becomes evident even before stippling is found in the blood.—J. C. A.

RECENT INVESTIGATIONS OF ABSORPTION AND EXCRETION OF LEAD IN THE ORGANISM. *J. C. Aub, A. S. Minot, L. T. Fairhall, and P. Reznikoff. Jour. Am. Med. Assn., Aug. 23, 1924, vol. 83, pp. 588–591.*

The results of new experimental work on lead intoxication are summarized. Absorption from the whole respiratory tract was found to be far more rapid in animals than absorption from the gastro-intestinal tract. Lead is carried in the blood stream as the tertiary lead phosphate in a highly dispersed colloidal form. It is then precipitated in various body tissues but mostly in the solid portion of the bones. The percentage distribution in the organs depends on the amount of lead being transported. Stored lead is normally slowly excreted from the body. Experiments have shown that this can be reduced by means of a high calcium diet and increased by means of a negative calcium balance. This

offers a new method of treating the disease, and various methods of increasing and decreasing the excretion of lead are described. The administration of acids, particularly when associated with a low calcium balance, is the most effective way to accelerate the release and excretion of lead from the body.—J. C. A.

DIFFERENCE BETWEEN "CONTRACTED" KIDNEYS DUE TO LEAD AND THOSE DUE TO OTHER FORMS OF NEPHRITIS. *G. Aiello. Il Lavoro, July, 1924, vol. 15, pp. 212–214.*

Lead nephritis presents a varying picture of both epithelial and interstitial changes and attacks either the blood vessels or the tubular epithelium. All contracted lead kidneys show in the tubules or the glomeruli inflammatory reactions which are lacking in the usual contracted kidney. When the patient has not been exposed to lead for a long time these lesions are absent. This suggests that lead nephritis is produced by the passage of lead through the excretory epithelium.—J. W. S. B.

BEHAVIOR OF SECRETION OF PEPSIN IN LEAD POISONING. *G. Reina. Il Lavoro, July, 1924, vol. 15, pp. 202–203.*

In acute and chronic plumbism the secretory power of the basal cells of the gastric mucosa is diminished, inasmuch as the granules are few, the nuclei pale, and the protoplasm of the cells is clear. This is found before any other pathologico-anatomic sign of lead gastritis, except some lymphocytic foci in the submucous tissues. This confirms the functional disturbance found clinically in early poisoning.—J. W. S. B.

CHOLESTERINEMIA IN ACUTE AND CHRONIC PLUMBISM. *A. Ceresoli. Il Lavoro, July, 1924, vol. 15, pp. 203–204.*

In acute poisoning in clinical cases and in animal experimentation the author found a transitory increase followed by lower cholesterin values in the blood. In chronic poisoning (with chronic nephritis) he found high cholesterin values exceeding the ordinary hypercholesterinemia of chronic nephritis. In chronic poisoning with acute attacks of colic, cholesterin was diminished according to the severity of the acute attacks.

The author considers that the lessened cholesterin values are due to lead primarily and that the increased values are due to the effect of lead on the kidneys. Cholesterin is present because of hepatic insufficiency but in acute cases, just as in infections, the body utilizes cholesterin to neutralize the toxic effects of lead.—J. W. S. B.

POTASSIUM IODIDE AND LEAD SALTS. *W. Eisner. Arch. f. exp. Path. u. Pharmakol., 1924, vol. 102, pp. 305–319.*

Concentrations of lead acetate and potassium iodide, which in aqueous solution give a precipitate, fail to do so in the presence of serum, but form a colloidal solution. Potassium iodide inhibits the toxic action of lead salts on fermenting yeast. These and similar results are correlated with the action of lead on living cells, which is regarded as being dependent on the formation of complexes in the protoplasm.—J. P.

RESULTS OF INVESTIGATION IN A PLANT MAKING LEAD COLORS. *F. Heim, E. Agasse-Lafont, and A. Feil. Abstr. from Presse méd., Sept. 6, 1924,*

vol. 32, p. 729, in Il Lavoro, Sept., 1924, vol. 15, pp. 284–287.

Twenty workmen in various occupations were examined. All except the foreman, who had been there twenty-two years, had worked less than one year.

The clinical findings were as follows:

	Number of Cases
Lead line	12
Basophilic stippling of red cells	17
Nucleated red cells	1
Mononucleosis (40–60 per cent. large mononuclears)	8

The symptoms were:

	Number of Cases
Colic (positive)	3
Colic (doubtful)	2
Parotitis	2
Hypertension (above 180 mm.)	4

These clinical signs and symptoms were, for the most part, observed in workers stirring litharge and red lead, and in packers. Lead line was found in one man six days after beginning work, and in another after fourteen days. Stippling was found in red lead workers three, four, and six days after beginning work, and a large number of stippled cells were found after months of absence from lead work.—J. W. S. B.

THE PREVENTION AND EARLY TREATMENT OF DISEASES INCIDENT TO THE PAINT, VARNISH AND CHEMICAL INDUSTRIES. *G. L. Apfelbach. Paint, Oil and Chem. Rev., May 14, 1924, p. 11, and May 21, 1924, p. 11.*

As a result of the careful work of the Committee for the Investigation of Industrial Disease in 1910, the Illinois Occupational Disease Law was passed in 1911 and was known as an act to enforce protection of certain employees from the dangers of occupational diseases. The act provides for good working and sanitary conditions, respirators, and medical attention, as well as for posting of wall notices by the employers to warn employees against occupational diseases.

Enforcement is accomplished through the Factory Inspection Department with the aid of two physicians who issue such orders as are necessary to bring the employer into compliance with the law. Since the enforcement of this law the number of cases of occupational disease has been noticeably reduced. At present there occur only about three to four cases of lead poisoning a month in factories coming under the jurisdiction of this Department, as against thirty-eight in August, 1914, and twelve in January, 1915. Lead, arsenic, and other industrial poisonings can be detected early. In most hazardous industries nature gives about one week's warning before permanent injury occurs. Physicians must, therefore, be well trained and alert; monthly examinations must be efficient, and all employees (clerks, carpenters, machinists, etc.) should be included. Where the health hazard is great, the hemoglobin estimates of every employee should be kept on record.—B. L. G.

LEAD IN PRINTING ESTABLISHMENTS. *Il Lavoro, Sept., 1924, vol. 15, pp. 283–284.*

Grodzowski (Moscow) determined the lead content of the air and dust in printing shops and of the dust on the hands of the workmen. He found that the air contained 0.8 to 1.153 mg. of

lead per cubic meter. The amount of lead in the dust varied according to the source of the dust. The hands of the workmen were washed with acetic acid and ammonia, and the wash water was analyzed. It was found to contain, on an average, 19.963 mg. of lead; in one case as much as 96.642 mg. was found.—J. W. S. B.

TUBERCULOSIS AND LEAD POISONING. *K. Kisskalt and F. Schütz. Deutsch. med. Wchnschr., Leipzig, May 23, 1924, vol. 50, p. 678.*

The authors attempted to determine why lead workers have higher mortality from tuberculosis than workers in some other trades. Lead was injected into rabbits intravenously and subcutaneously. In three weeks they showed signs of lead poisoning—*i.e.*, basophilia. Then bovine tubercle bacilli were injected intravenously into these rabbits and also into a control group of rabbits. Pulmonary tuberculosis was just as frequent in both groups of animals as was tuberculosis of other organs. There was no correlation between lead in the lungs and pulmonary tuberculosis. Hence, lead poisoning does not increase susceptibility to pulmonary tuberculosis, and higher mortality must be due to other causes.—H. E. H.

THE LEAD WORKER'S FAMILY. *L. Devoto. Il Lavoro, Sept., 1924, vol. 15, pp. 259–261.*

In an address to the first Eugenic Congress at Milan, the author gave his opinion that the lead worker's family is numerically and physically inferior and has a disposition to occupational and other diseases unless special measures are taken. He recommends employment only of young men of good health and good heredity; instruction of workers as to the premonitory signs of lead poisoning (presaturnism); periodic examinations; and sanitary measures.—J. W. S. B.

TETRA-ETHYL LEAD—ANOTHER INDUSTRIAL HAZARD. *Jour. Am. Med. Assn., Nov. 8, 1924, vol. 83, p. 1511.*

This is an editorial dealing with the hazards of the manufacture of lead tetra-ethyl and the possible danger to the public health from the use of gasoline treated with this substance.—K. R. D.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

TAR CANCER IN FRANCE. *P. Courmont. Jour. State Med., Nov., 1924, vol. 32, pp. 539–541.*

Tar cancer is relatively frequent in England. Our researches show it to be extremely rare in France. In England of 2,500 workmen employed in the patent fuel industry (briquettes) from January, 1920, to June, 1922, forty-nine men (about 2 per cent.) were found to be affected with suspicious ulcerations requiring surgical intervention. In France, in the factories of Lyons, the Loire (St. Etienne), Isère, and Gard we did not find a single case of cancer caused by tar or pitch. Our colleagues in the hospital of Lyons, St. Etienne, Paris, and in the afore-mentioned industrial districts have been able to supply only four observations.

The reasons given why pitch and tar cancer occur more frequently in England than in France are:

1. Race.
2. Climate: Northern countries are more exposed to this form of cancer.
3. The nature of products used.
4. Temperature and rate of production. (Dr. Legge points out that pitch and tar when raised slowly to a high temperature, as in a gas works, are more toxic than when raised rapidly to a lower temperature, as in a coke oven.)
5. Origin of products: Pitch and tar present a toxicity differing according to their origin.

Ross and Cropper, in 1913, established also: (1) Pitch from gas tar is injurious, but not that from coke-oven tar; (2) distillation of gas tar at 300° produces a harmless pitch (soft

pitch); (3) anthracene oil is not so injurious as crude commercial anthracene.

Prophylatic measures for pitch workers are important in France, as in England. They include: (*a*) wearing of goggles; (*b*) work in the open air; diminution of pitch dust; (*c*) suitable clothing to be frequently washed; strict cleanliness; (*d*) provision of immediate attention for burns or other accidents.—D. A. C.

CHARCOAL AND METAL SALTS. *Rakusin and Nesmejanow. Abstr. as follows from München. med. Wchnschr., Aug. 22, 1924, vol. 71, p. 1168, in Jour. Am. Med. Assn., Sept. 27, 1924, vol. 83, p. 1041.*

Rakusin and Nesmejanow's experiments demonstrate the marked absorption of dissolved salts of mercury and silver and, to a less extent, of lead by vegetable charcoal. This proves again that the use of this charcoal in poisoning is rational.—K. R. D.

MODE OF ACTION OF PHOSPHORUS. *K. Engel. Arch. f. exp. Path. u. Pharmakol., 1924, vol. 102, pp. 289–304.*

In the course of cardiac and other comparative tests on frogs, mice, and guinea-pigs it is shown that sodium phosphite is more toxic than organic phosphite compounds, while aqueous solutions of phosphorus are still more toxic than the former. Sodium hypophosphite, on the other hand, has comparatively little toxic action.—J. P.

CARDIOVASCULAR STATUS IN NITROGLYCERIN WORKERS. *J. Heitz. Abstr. as follows from Arch. d. mal. du coeur, Sept., 1924, vol. 17, p. 578, in Jour. Am. Med. Assn., Oct. 18, 1924, vol. 83, p. 1279.*

Heitz' examination of twenty-six workers showed that the employees in the first day, also visitors, several hours after a sojourn in the factory, suffer with headache, followed by nausea, vomiting, and sometimes diarrhea. A noticeable loss in weight occurs in the beginning. The disturbances may persist in some instances for two or three days. The workers soon become accustomed to it, but if they interrupt the work for several weeks, the same disturbances appear on starting to work again. No changes in heart function, in the rhythm of the pulse, or in the oculocardiac reflex have been noted. The blood pressure decreased slightly during the work, to become normal in the first hour of rest. He relates that only one instance of similar research has been published. This was Ebright's study of twenty men working in a dynamite factory in California. The findings were identical.—K. R. D.

DUST HAZARDS AND THEIR EFFECTS

THE VALUE OF THE KONIMETER—BEING AN INVESTIGATION INTO THE METHODS AND RESULTS OF DUST-SAMPLING AS AT PRESENT PRACTISED IN THE MINES OF THE WITWATERSRAND. *A. Mavrogordato. So. African Inst. Med. Res., Pub. No. 17, Aug., 1923.*

This paper is a valuable contribution to the subject of dust estimation.

Moreover, it is unbiased, as one conclusion indicates—*viz.*, that all methods used, whether gravimetric or by counting, are valuable; all give a measure of the dust risk present; but for comparative purposes at any place the same method should be used and by the same observers. This conclusion calls to mind Kipling's dictum concerning making tribal verse. It is based on the opinion that most dust samples of the same kind do not differ appreciably in the number of particles of different sizes that they contain. The author holds in connection with silica dust that, pathologically, particles above 5 microns are comparatively unimportant, that particles 5 microns to 1/4 micron are phthisis-producing, and that smaller particles are, like the larger, comparatively unimportant. The dangerous particles are about the size of common pathogenic micro-organisms. The evidence assembled to exonerate the ultramicroscopic particles, although suggestive, is hardly convincing; the idea has a claim to originality.

All methods described for dust estimation are discussed; particular attention naturally is given to the methods used on the Witwatersrand—namely, the sugar-tube gravimetric method with the Muir and Johnson technic and the konimeter of Sir R. Kotzé. The reporter does not appear to have yet used Owens' dust counter and only refers to it; possibly this omission is due to a curious delay between issue of this publication and its preparation—we note that it is dated Aug. 1, 1923, but it only reaches us at the end of 1924.

As a result of dust sampling the conclusion is drawn that dust concentration is largely a matter of air movement, the better the air current the less the concentration; and that, with linear velocities exceeding 60 feet per minute, not only are dust returns low, but dust deliberately raised is quickly removed. Hence the kata-thermometer is proposed for use to measure air movement of low velocity. Medical records are quoted to show that the occupational disease, miners' phthisis, exists; that it has been growing progressively less prevalent (from 32 per cent. in 1912 to 3 per cent. in 1923); and that cases are still developing. Meanwhile gravimetric dust sampling gave an average of 4.9 mg. per cubic meter in 1915, 2.9 mg. in 1919, and 1.3 mg. in 1923.

The question is raised as to whether dust trouble is proportionate to the average amount of dust present or whether it results from occasional exposure to intense dust clouds or dust floods. The author leans toward the latter possibility, as he considers that the lungs can always dispose harmlessly of a moderate amount of dust.

Methods of suppressing dust are referred to, such as localized exhaust contrivances, water spray, and the use of hygroscopic colloids either as washes or as sprays; electric precipitation is also considered. Finally lines of advance are suggested to lie in three directions: (*a*) systematic, thorough ventilation of workplaces; (*b*) preliminary treatment of water used for spraying and washing down; and (*c*) perhaps the use of exhaust drafts and hoods.—E. L. C.

THE USE OF OWENS' JET DUST COUNTER AND OF ELECTRIC PRECIPITATION IN THE DETERMINATION OF

DUSTS, FUMES, AND SMOKES IN AIR. *P. Drinker and R. M. Thomson. Jour. Am. Soc. Heating and Ventil. Eng., Nov., 1924, vol. 30, pp. 695–710.*

Distinction between dusts, fumes, and smokes is made on the basis of particle size and the general methods by which the particles are liberated into the air.

Owens' jet dust counter is described, and its usefulness in general dust problems discussed with the aid of photomicrographs of dusts and fumes collected by his device.

Electric precipitation is discussed in its theoretical and practical aspects as applied to small precipitators for the determination of dusts, fumes, and smokes in air. It is shown that practical operating efficiencies at close to 100 per cent. can be obtained in field and laboratory work. Photographs of complete and incomplete precipitation of ammonium chloride fume are given.

A method of mounting transparent celluloid foils on which particles have been precipitated is described in detail. By this method measurements of particle size may be made from the collected sample of dust, fume, or smoke without disturbing the precipitate.—P. D.

EXPERIMENTS WITH COLLOIDAL OIL (BITULOID) AS A MEDIUM FOR LAYING COAL-DUST. *H. Briggs and N. H. Wallis. Proc. So. Wales Inst. Eng., Sept., 1924, vol. 40, pp. 233–235.*

Explosions travel through the galleries of coal mines owing to the wave of detonation wafting up from the sides and floor of fine coal dust which then forms an explosive mixture with the air. The usual method of prevention consists in diluting the coal dust with inert stone dust; dust so diluted no longer forms an explosive mixture with air. The authors propose another method: the sides and floors are sprinkled with bituloid which catches and binds the coal dust so that it cannot rise. Bituloid, which is extensively used for laying dust on surface roads, consists of Mexican bitumen 15 to 20 per cent., green tar oil 30 to 35 per cent., dispersator of oleic acid and caustic soda 1 to 2 per cent. and water 48 to 49 per cent. It possesses a much lower surface tension than water—a property to which it owes its capacity for catching dust; moreover it does not dry rapidly.

Tests are described wherein in an experimental gallery (*a*) explosions were readily obtained after the sides had been dusted with coal; but (*b*) no explosions could be obtained if, after dusting, the gallery had been sprayed with bituloid, or if, after being sprayed with bituloid, the gallery had been charged with coal dust.

The authors point out that stone dusting may increase the risk to which miners are already exposed from bronchitis and pneumonia and that their method of laying the explosion danger is not associated with this risk. The method is at present only in the experimental state.—E. L. C.

ROCK DUSTING OF COAL MINES. *T. G. Fear. Am. Labor Legis. Rev., Sept., 1924, vol. 14, pp. 213–217.*

"The purpose of rock dusting coal mines is to place upon the surfaces of the underground workings a finely powdered, inert dust, which, when placed in suspension by an air blast caused by a blown out shot or explosion of gas will extinguish and prevent further propagation of the flame."

The causes of coal dust explosions may be prevented by the elimination of all ignition hazards and the treatment of coal dust to make it inert or as nearly so as possible. There are three ways of accomplishing the latter: sprinkling, humidification process, and rock dusting. Sprinkling is not an effective way of wetting coal dust; the humidification process is expensive and the relative humidity of mine air is variable. Rock dusting has been recognized as efficient and inexpensive. By this method other advantages are also gained: a 10 to 25 per cent. increase in lump coal; 10 to 30 per cent. less smoke; a substantial credit by insurance companies; and increased illumination on haulage ways, which should result in fewer accidents.

At the Indianola mine 46,000 feet of entries were dusted with 105,400 pounds of dust at a total labor cost of $505.73, or 0.7 cent per ton of coal mined.

The United States Bureau of Mines recommends for dusting a powdered mineral, all of which will pass through a 20-mesh screen and half through a 200-mesh screen. The dust is to contain less than 2 per cent. combustible material and is to be free from silicious particles. Limestone dust fulfils all these requirements.

With the use of permissible explosives, lamps, and machinery, rock dust stemming, and rock dusting of the mines, coal dust explosions can be controlled and practically eliminated.—B. L. G.

THE PULMONARY LESIONS PRODUCED BY THE INHALATION OF DUST IN GUINEA-PIGS. *H. M. Carleton. Jour. Hyg., July, 1924, vol. 22, pp. 438–472.*

After a summary of previous literature, the materials and methods employed are detailed and a description is given of the histology of the normal guinea-pig lung. The experiments carried out are next described in which dusts were used composed of flint and coal, china clay, felspar, ground pitcher (earthenware), pure amorphous silica, pure flint, coal, shale, ignited shale, dried earth, and ignited earth. The animals were examined after the lapse of periods varying from a few hours up to twenty-three months. Coal was found to initiate early phagocytic response which led to rapid elimination of much flint dust simultaneously inhaled, but not all; possibly coal dust might be beneficial in metalliferous mines. China clay, contrary to expectation, was found a potentially dangerous dust, as also were felspar and ground-up earthenware. The inhalation of amorphous silica produced lesions even more severe than did crystalline silica. Coal dust underwent rapid elimination from the alveoli due to brisk phagocytic response. Shale dust was found comparatively harmless, even when previously ignited. The lungs showed a peculiar tolerance toward earth dust. The author favors the view that dust cells are mostly derived from alveolar epithelium, but leukocytes may possibly also act as dust cells. When the paths of dust elimination are examined, the more harmful a dust is to the lungs the less far is it found to be removed from the alveoli and the less complete is its removal.

No evidence is found to justify the view that harmfulness of a dust is proportionate to the degree of angularity and sharpness of its constituent particles; but the reason why one dust is harmful and another is not is yet unsolved. This important paper is well illustrated.—E. L. C.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

Report of the Miners' Phthisis Medical Bureau for the Twelve Months Ending 31 July, 1923. *Union of South Africa, Capetown, 1924.*

Peculiar interest attaches to each succeeding annual report from the South African Miners' Phthisis Bureau in which is told the progress made and the methods adopted in its great campaign against silicosis, the forerunner of tuberculosis. Appreciation is spreading of the fact that this disease combination is not confined to metalliferous miners but is widespread, affecting many occupations wherein risk exists from exposure to silica dust. The Bureau is breaking new ground and acquiring knowledge which must be invaluable when preventive measures come to be applied to other industries and other conditions. The value of radiography, owing to recent improvements, is stressed and now "if a technically satisfactory radiograph, taken within a few months of death, has not disclosed the earliest signs of simple silicosis, these will not be discovered by the pathologist." Considerable weight is also given to finding that abnormality of the cardiac shadow which is known as the "vertical heart"—"a sign which is always strongly suggestive of the presence of a tuberculous infection."

One great function of the Bureau is related to determining the right to compensation; this function underlies the scientific classifications adopted. Hence we read "the signs of silicosis are considered to be present only when they can, with certainty, be recognised by unaided vision and touch after cutting open the lung. Microscopic investigation of the lungs of all adults (at least of those who have resided in the Transvaal) usually discloses a certain number of minute areas in which a few incarcerated silica particles, associated with the essential changes of simple silicosis, can be found. It is for this reason that the verdict of the pathologist as to the presence of the disease silicosis must be arrived at without the aid of the microscope; for clinical observations thus far have shown that no detectable impairment of function exists during life unless the affected areas are sufficiently numerous and large to be visible and palpable *post mortem*." On this basis no signs of silicosis could be discovered in 29 out of 98 deceased miners, 7 of whom had worked underground six years, another 7 over nine years, and 2 over twelve years; one of the latter 2 had worked underground on the Rand sixteen years, and previously for thirty years had mined tin and copper ores; whence follows the conclusion that exposure to silica dust does not affect all alike. Evidence is again given against the hypothesis that

habitual inhalation of silica is responsible for the production of chronic nephritis.

Careful periodic examinations of 12,691 working miners every six months resulted in detecting an attack rate for open tuberculosis of 1.3 per thousand, which seems commendably low. The open form of simple tuberculosis, as usual, presented a higher case mortality year by year than the closed form; but in these cases silicotic changes are frequently detected post-mortem. Early detection and elimination of cases of silicosis is causing a continuous decline in the occurrence of more advanced cases. For the first time since initial examination on engagement was instituted seven years ago, two cases of newly silicotic miners have occurred. One of these men had been subjected accidentally to "two abnormal inflictions of dust and fumes from blasting;" the other had worked "stoping with dry-Jack-hammer machines in inadequately ventilated stopes"—this type of machine drill is now prohibited. The high standard of health demanded at the initial examinations is shown by the fact that 55 per cent. of the applicants were refused engagement. The ages of those rejected are of interest; the highest percentage of refusals, 69.8, was for the group under 18 years of age, declining to 46.1 per cent. at ages 26 to 29, and rising thereafter to 67.7 per cent. at 46 years and over.

The policy of eliminating all cases of tuberculosis from the mines in order to minimize possibilities of infection is being justified, and the figures indicate that "the risks of occupational infection with tuberculosis have very markedly decreased of late years, both amongst miners and native labourers." When once simple silicosis has declared itself, the future course of the disease is not found to be much benefited by relinquishing underground work; the reason adduced is that "at least the great majority of cases of simple silicosis owe their earliest detectable development to the presence of an occult tuberculous element." Tuberculous infection precipitates and hastens the silicotic process; infection is the great danger, hence prompt retirement is of advantage, if not to the patient, to his fellow workers. The largest number of cases originated among those in their ninth year of service. The mortality rates in succeeding years occurring among miners known to be silicotic before they became tuberculous and among those in whom silicosis had not previously been detected are so similar as to support the existence of a close correlation between silicosis and tuberculosis; thus 79.7 per cent. of the former and 81 per cent. of the latter had died by the end of the fifth year subsequent to detection.

Previous occupation in mining exerts its influence; out of 25 men with simple tuberculosis discovered at periodic examinations, 7 had previously worked in coal mines, and only one in getting metalliferous ores; but out of 255 men with simple silicosis, 23 had worked previously in coal mines and 24 in getting metalliferous ores. The risk involved from work in the Rand mines increases with the length of employment up to about ten years, but thereafter seems to remain steady; thus the rate per 1,000 employed of all fresh cases (whether anteprimary, primary, or secondary) was nil in the first three

years of employment, 4 in the second three years, 29.1 in the next three years, 48.1 for those employed ten to fifteen years, 39.1 for those employed fifteen to twenty years, and 45 for those employed twenty years and over.

Experience from the Rand certainly teaches that exclusion of tuberculous infection is not only possible, but a most powerful influence in checking the spread of the disease.

Native labor continues to suffer more from simple tuberculosis than does European labor, but, on account of shorter service with the mines, it suffers less from silicosis; thus for every 1,000 Europeans affected with simple tuberculosis, simple silicosis, or tuberculosis-with-silicosis, there were respectively 1,808, 9, and 720 native laborers affected. Pathologic examinations of lungs exhibited a similar tendency, since among 98 European cases 50 per cent. were found with tuberculosis with or without silicosis, while among 194 native cases 86 per cent. were so affected; 70 per cent. of the 98 cases showed silicosis, but only 56 per cent. of the 194.—E. L. C.

PNEUMONOKONIOSIS. *A. Böhme. Abstr. as follows from Klin. Wchnschr., Oct. 14, 1924, vol. 3, p. 1909, in Jour. Am. Med. Assn., Nov. 29, 1924, vol. 83, p. 1803.*

Böhme analyzed chemically the lungs of miners. Coal does not cause induration of the lungs if its concentration is under 1.4 per cent. There is marked pneumonokoniosis with half this amount of stone dust. The black color of a lung and the presence of coal particles do not prove that the induration is due to coal inhalation. Stone dust, present in much smaller amounts, may be the cause.—K. R. D.

A CASE OF IRON-STONE PHTHISIS. *K. Goadby. Lancet, Oct. 11, 1924, p. 752.*

The chest of an iron-stone miner when radiographed in May, 1919, showed shadows indicative of fibrosis. The man died of tuberculosis in December, 1923. The lungs showed typical signs of medium fibrosis. The fibrous tissue was permeated with iron and stained blue with potassium ferrocyanide. The iron ore which the man worked was oxide of iron containing a small amount of silica. Whether the fibrosis was due to the silica or to the iron is doubtful, but the presence of iron in the fibrous tissue is remarkable.—E. L. C.

CALCULI IN LUNGS OF STONE-CUTTERS. *E. Brock. Abstr. as follows from Med. Klin., Oct. 19, 1924, vol. 20, p. 1464, in Jour. Am. Med. Assn., Nov. 29, 1924, vol. 83, p. 1804.*

Brock observed a case of calculosis of the lungs in a tuberculous stone cutter. Contrary to expectations, the calculi consisted of calcium phosphate and carbonate. He denies the direct connection with the occupation, and believes that secondary tuberculous infection was the cause.—K. R. D.

TUBERCULOSIS OF CHINA WORKERS. *Brinkmann. Abstr. as follows from München. med. Wchnschr., Sept. 5, 1924, vol. 71, p. 1233, in Jour. Am. Med. Assn., Oct. 18, 1924, vol. 83, p. 1283.*

Brinkmann discusses the relation between chalicosis and tuberculosis in china workers. He confirms the ex-

perience that tuberculosis predominates between the ages of 25 and 40, while chalicosis affects the more resistant between 40 and 50.—K. R. D.

INVESTIGATIONS OF SIXTY-ONE CASES OF HUMAN ANTHRAX OCCURRING IN NEW YORK CITY DURING THE FIVE YEARS 1919–1923. *W. Jacobsohn. N. Y. City Dept. Health, Month. Bull., July, 1924, vol. 14, pp. 145–155.*

Sixty-one cases of human anthrax occurred in New York City during five years (1919–1923). The number of cases for the cool season was 40, as compared with 21 for warm weather. Of the 61 cases, 6 were women, and 2 of these were fatal. The fatality rate for the entire series was 31 per cent., or nineteen deaths. The patients ranged in age from 10 to 69, but most of the cases occurred during the most active group periods of life. About one-third of the cases were among brush-makers, warehousemen, truckmen, and longshoremen.

There seem to have been two main sources of infection: animal hair, or articles made from animal hair; and animal hides, skins, or articles made from animal hides. The symptoms and the course of the disease were those peculiar to anthrax. The method of treatment was chiefly with anti-anthrax serum, sometimes combined with incision, with excision, or with chemical cauterization; the best results were obtained from the administration of anti-anthrax serum alone.

The legislation regulating the suppression and control of anthrax in New York City is summarized, and acknowledgment is made to publicity and public health education as great aids in enforcing the laws.—B. L. G.

ANTHRAX IN FRANCE. *Internat. Labour Rev., Sept., 1924, vol. 10, pp. 486–494.*

In France, as in other countries, anthrax among animals fell during the war when importation of infected material was restricted; 763 cases occurred in 1913, but only 248 in 1918 and 397 in 1919, the number rising to 632 in 1921 and 621 in 1923. Among human beings employed in industry 443 cases (with a case mortality of 12.4 per cent.) occurred between 1910 and 1922; of these 58.9 per cent. resulted from handling hides and skins, and 25.0 per cent. from wool. While infected material came from many sources, Spain and Portugal provided 17.8 per cent., Africa 12.6, the Mediterranean Basin 10.0, South America 8.6, and France only 3.2. Clearly, the main problem in France in regard to anthrax among animals and among men is one arising from imported materials. The materials causing anthrax were raw in 401 cases out of 443. In the hide and skin industry out of 261 cases 34 occurred in loading and unloading, 34 at wool-pulling, 143 at tawing, and 46 at tanning; in this industry the danger is present from the time the material arrives at the port. In the wool industry out of 111 cases only 3 occurred at commercial operations but 90 at washing and sorting; here the danger is almost confined to factory premises.

The hair and bristle industry is responsible for 34 cases, all of which occurred during industrial processes.—E. L. C.

ANTHRAX IN CZECHOSLOVAKIA. *Internat. Labour Rev., Sept., 1924, vol. 10, pp. 494–496.*

Anthrax among animals in Czechoslovakia as in other parts of Europe diminished during the war from 398 in 1913 to 210 in 1918 and 119 in 1919. The reduction is ascribed to the temporary prohibition of importation of foreign skins and hides. The figures have recently increased, especially in the neighborhood of tanneries (from infection of waste water). Most of the imported hides and skins come from Russia, India, Java, and South America. Among human beings 130 cases with 11 deaths occurred in 1921 and 1922; the frequency is increasing, and the cases occur among those in charge of animals, or in persons handling skins and hides. No cases are reported in the wool industry.—E. L. C.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

BAKERS' DERMATITIS. *A. C. Parsons. Brit. Med. Jour., Sept. 13, 1924, vol. 2, p. 464.*

This is a brief report of work covered at length in an article by Parsons published in THIS JOURNAL, "Abstract of Report on Bakers' Itch" (see 1923–1924, vol. 5, pp. 410–433).

COCA BOLA DERMATITIS. *Indust. Hyg. Bull., Sept., 1924, vol. 1, p. 11.*

Various writers have cited dermatitis and conjunctivitis from the use of cocobolo wood as occupational diseases. A number of cases of dermatitis have occurred in workers making handles for cutlery when Panama cocobolo was used. With Nicaraguan cocobolo no ill effects were observed.

A further study is to be made to determine the question of toxicity in wood from different localities.—B. L. G.

OCCUPATIONAL ABDUCENS PARESIS. *C. E. Ide. Am. Jour. Ophth., Sept., 1924, vol. 7, p. 704.*

A court stenographer, 33 years of age, having a negative etiology, suffered from diplopia. Paresis of the right external rectus was diagnosed by use of the ruby lens test. The case was thought to be a peripheral occupational necrosis. There was ultimate recovery after a fishing trip for rest.

The conclusion was reached that the weakness of the abducens resulted from constant typewriting, the notes being placed to the right and the eye kept on the notes, the man using the touch system of writing.—B. L. G.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

SKIN SENSITIVENESS TO NONBACTERIAL PROTEINS AND TOXINS. *R. C. Low. Brit. Jour. Dermat. and Syph., July, 1924, pp. 292–311.*

In this study, which is one of personal experiment and review of other work in the same field, many questions arise of interest to the industrial physician.

Immunity is rarely found to be produced by previous attacks of poisoning by plants or from the effects of chemical irritants. Low quotes Nestler and Simpson. The latter shows that it is not the protein in the Primula obconica but the crystals and oleoresins (chemical substances) which cause the rash in susceptible people. The same is true of the dermatitis produced by the Rhus family and plants like the jonquil and the daffodil. In investigating the harmful effects of opium on the skin he discovered that they were due to the salts and alkaloids: codeine phosphate, heroine hydrochloride, and morphine hydrochloride. He suggests that by testing these on the cutaneous surface of the employees it could be discovered which worker could, with impunity, handle certain substances. Atropine sulphate is another hurtful agent. From such

facts he concludes that dermatitis venenata is not a true anaphylactic state. Other investigators have shown that no specific antibodies are present; that it is not possible to sensitize an animal actively to the poison of a plant, or passively to the serum of a susceptible individual. Low and his brother were both insensitive to the Primula obconica, but both became sensitive after friction on the skin with the leaves or juices of this herb. Six other persons, however, whom he tried to sensitize, using the same ritual, did not respond. Nestler has produced artificial sensitization and has proved that the irritating material can penetrate through the unbroken corneous layer of the skin.

The reactions so far discussed are general—that is to say, they can be excited on any part of a sensitized person's skin by the application of the specific agent. Strangely enough the mucous membranes do not show this response to Primula, Rhus, or iodoform, even in a sensitized individual.

Low cites Bloch, who demonstrated that sensitization lies in the skin and not in the blood or the organs. Bloch, who was sensitive to the ringworm poison, cut a piece of his own skin and another from a man who was insensitive to this poison. These he planted on the leg of a third man. Bloch found that his graft alone reacted to the application of the trichophyton poison.

Sensitiveness may be local or general. Barber mentions a baker whose hands and arms only reacted to flour. A dermatitis is reported by Markley, on the face, neck, chest, arms, and hands but not elsewhere on the body, from handling a guinea-pig. Pirquet's own left arm, into which he habitually made injections of tuberculin, was many times more sensitive than the right.

It is possible that immunity to a specific agent may be produced by local irritation extending over many years. Low thinks that as far as plant poisoning is concerned it is more likely to result when given internally or by intravenous or intramuscular injection. When an irritating substance causes wheals to form round the follicles in a few minutes, and when these wheals last only a few hours, these are evidences that the substance is exerting only a mechanical action. If, on the other hand, the inflammation extends, producing a dermatitis, this signals sensitization. There may be no reaction to the first exposure to a noxious influence; but if one follows the second or later exposure, this indicates sensitization. Another indication is given when papule formation lasting several days follows the bite of an insect or the sting of a plant. The presence of immunity after repeated irritations is also a sensitizing phenomenon.

A number of cutaneous protein tests are recorded.

The writer has endeavored by experimental work to simplify a difficult subject and to generalize from reactions which permit of diverse explanations. It is a pity that more generalizations, based on sound facts, are not attempted because they initiate close criticism and inspire much useful work.—R. P. W.

HOP DERMATITIS. *W. J. O'Donovan. Lancet, Sept. 20, 1924, vol. 2, pp. 597–598.*

Although so large a number of London poor migrate annually to the hop gardens of Kent, O'Donovan is struck by the fact that his two reported cases are the only ones which have attended the London Hospital. He explains it by saying that the eruption is so severe, although it lasts only a few days, that anyone once affected will carefully avoid exposure to the plant. On the hands, face, and genitals appear closely packed, minute vesicles on an erythematous base. The eyelids are frequently so much swollen that the sufferers cannot see. The rash is often mistaken for erythema solare, impetigo, erysipelas, or urticaria.—R. P. W.

Occupational Diseases of Hop-Picking. *S. N. Galbraith. Lancet, Oct. 25, 1924, vol. 2, p. 885.*

Three occupational affections are reported: dermatitis, which resembles scarlet fever but concerns only exposed parts, particularly the knees and wrist; acute catarrhal conjunctivitis with copious purulent discharge and photophobia, known as "hoppers' eye;" and synovitis, or "hoppers' gout," wherein the wrist joints which come in direct contact with the hops are swollen and tender. This year, owing to the remarkable absence of "vermin" from hops, no washes have been used; hence chemical irritation can be excluded and the plants themselves must be blamed for the troubles.—E. L. C.

Treatment of Chemical Burns of the Eye. *V. R. Hurst. Texas State Jour. Med., May, 1924, vol. 20, pp. 41–42.*

There is at present an increasing prevalence of burns of the eye, due to exploding of storage batteries, use of chlorinated lime for household purposes, etc. Injuries of the eye from chemicals are grouped as mild cases and severe cases, according to their intensity. The treatment for mild cases consists of applications of a soothing collyrium. In severe cases, where there is complete destruction of the conjunctiva, it may be necessary to graft mucous membrane from the mouth to replace the destroyed conjunctiva. In the case described, that of a man whose right eye was burned with hot sulphuric acid from the explosion of a battery, a method is described for protecting the conjunctiva from irritative secretions and interference with its nutrition. The accident occurred on Sept. 27, 1921. On Jan. 12, 1922, after the hospital treatment described, there was a small band of adhesion in the upper fornix, which interfered very little with mobility of the eyeball. The vision in the injured eye equaled 20/70, and the patient was able to resume his former occupation.—B. L. G.

Injury of Eye from Ammonia. *P. J. Waardenburg. Abstr. as follows from Nederlandsch Tijdschr. v. Geneesk., July 19, 1924, vol. 2, p. 372, in Jour. Am. Med. Assn., Sept. 6, 1924, vol. 83, p. 802.*

Waardenburg calls attention to the extreme gravity of the damage when ammonia is spurted into the eye. Thies has recently described a case in which one eye had to be removed and cataract developed in the other. In Waardenburg's case, the eye, a year later, looks as if it had passed through central keratitis, and vision is almost

entirely lost. He treated the eye at first by rinsing out with physiologic salt solution, and a petrolatum bandage. Later he succeeded in curing the erosions with scarlet red ointment, the young woman being still under treatment. He does not know of any effectual treatment for injury from ammonia; it seems to be more dangerous than corrosion with lime.—K. R. D.

MINERS' NYSTAGMUS: ITS PREVENTION AND CURE. *T. L. Llewellyn. Tr. Inst. Min. Eng., Oct., 1924, vol. 68, p. 57.*

In this paper the author assumes that the conclusion, reached by the Miners' Nystagmus Committee and published in the first report, that miners' nystagmus was caused by the deficient light in the coal mine is correct. The requirements of good lighting are: (*a*) sufficient illumination; (*b*) avoidance of glare from the source of light; and (*c*) avoidance of inconvenient shadows on the work. Under physiologic considerations the importance of the process of dark adaptation by which the miner "gets his sight" after descent is discussed.

The illumination of a coal mine is deficient for the following reasons: (*a*) the low candle power of the lamp used; (*b*) the distance that the lamp has to be placed from the working area; (*c*) the absorption of incident light by the coal. Illumination is unsatisfactory owing to lack of contrast, limited area of illumination, and faulty position of the lamp. The low places of the mine necessitate the placing of the lamp at eye level.

Photometric measurements of the amount of light reflected from the coal face are given, and the question of the quality of the light is discussed. In Great Britain experiments have been tried for the last eighteen months on the effect of using lamp glasses tinted a yellowish green, with the object of relieving glare. These experiments have met with approval from the workers, but it is yet too early to draw definite conclusions as to their value. The importance of illuminating the roadways with the result of increasing the rate of travel underground and helping the men to get their sight is also treated. Photographs of roadways before and after whitewashing show the enormous improvement which is effected by this simple means.

Lamps are "primary" machinery and worth the strictest attention. The employment of a simple form of photometer is advised as it is very difficult to estimate the candle power of any lamp from inspection alone.

The economic aspect of the disease is also discussed, and it is estimated that in 1922 the amount of compensation paid for miners' nystagmus was half a million pounds.

The general principles of treatment are given and the importance of providing surface work for partially incapacitated workmen is insisted upon. Unemployed men are said to become unemployable. Statistics are given showing that when surface work is provided the incidence rate is low but where the colliery officials fail to provide work the cases accumulate and the incidence is high.

Summary.—Miners' nystagmus is the result of deficient illumination. *Preventive measures:* (*a*) To enable the process of dark adaptation to be carried out quickly and comfortably, the

pit bottom and main traveling roads should be whitewashed and brightly illuminated; (*b*) all lamps in use on the traveling roads should be shaded; (*c*) the candle power and area of illumination of the safety lamp should be increased or electric cap-lamps used; (*d*) glare should be avoided by the use of shades, the careful placing of the lamps, and possibly by the use of colored glasses. *Curative measures:* (*e*) Temporary removal from underground work; (*f*) encouragement and peaceful persuasion by the medical man; (*g*) provision of graduated surface work by the management.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

ACCIDENTS IN INDUSTRY. *Med. Jour. Australia, Sept. 13, 1924, vol. 2, pp. 277–278.*

This leading article is mainly of interest for exhibiting the world-wide attention now being paid to accident prevention. It is based on the resolutions passed in 1923 at Geneva by the Fifth International Labour Conference. The importance of the personal factor is dwelt upon, and attention is drawn to the action of the Metropolitan Life Insurance Company of New York in regard to tuberculosis and the town of Framingham (Mass.).—E. L. C.

ACCIDENT PREVENTION. *C. B. Auel. Manufacturers News, Oct. 18, 1924, vol. 26, pp. 6, 24.*

The keeping of accident records, although of prime importance, is often both neglected and ignored. State compensation laws require fairly comprehensive reports of accidents, making it now necessary to keep some sort of accident statistics. No set of general rules for the formulation of such statistics can be laid down, yet there are four records at least which must be kept for an intelligent study of accidents. These are:

1. Number of accidents.
2. Accident frequency.
3. Accident severity.
4. Causes of accidents.

With a list of the number of accidents and the number of hours worked, the accident frequency can be calculated and the variation from month to month determined; this decimal is multiplied by 1,000,000, and the result is the number of accidents per million hours worked or per million hours' exposure.

The accident severity is obtained by dividing the time lost due to accidents in any given period by the total hours worked during that period; this decimal is multiplied by 1,000 and the result is the number of days lost per thousand hours worked.

These methods have been adopted by the International Association of Industrial Accident Boards and Commissions, by the National Safety Council, and by statisticians generally, and are valuable in comparing one industry or plant with another or in computing accident ratings. Such comparison, however, is of little value for other than rating purposes unless it serves as a point from which to start when commencing accident prevention in a particular plant on a systematic basis.—B. L. G.

THE PREPARATION AND USE OF ACCIDENT STATISTICS. *A. S. Regula. Safety Engin., Aug., 1924, vol. 48, pp. 53–57.*

The use of accurate accident statistics is a fundamental factor in effective accident prevention work in any plant as providing:

1. An indication of accident hazards in particular departments or occupations so as to bring about a concentration of effort for their elimination.

2. An effective means of interesting executives and supervisors in safety work by clearly indicating the waste and loss of efficiency attendant upon accidents.

3. A means of stimulating employees to increased effort to produce a record which will compare favorably with their own past record and with that of other departments.

4. A basic means of gaging the effectiveness of accident prevention work in any plant.

5. A basic means of comparing the accident rates of different plants in the same industry and between different industries.

Three sets of records are necessary for preparing adequate statistical data. First, the frequency of accidents in relation to exposure; second, the severity of accidents in relation to exposure; and third, the classification of accidents as to causes. It is suggested that accident frequency rates be expressed in terms of the number of lost-time accidents per million hours. To express accident severity rates correctly, it is suggested that one use a table of weights advocated by the International Association of Accident Boards and Commissions and the United States Bureau of Labor Statistics.

As to a classification of causes, one is given provisionally because it is felt that it is difficult to prepare a classification which will be suitable for use in every plant.—H. B. E.

STANDARDIZING ACCIDENT STATISTICS. *L. W. Chaney. Safety Engin., Oct., 1924, vol. 48, pp. 155–158.*

For nearly fifteen years the United States Bureau of Labor has been collecting the facts concerning accidents in the iron and steel industry. New methods of treatment have been devised so that the information is as complete and accurate as that in any other industry. From these records it is easily seen that standardized statistics have been an important factor in the safety movement. The necessities of an accident prevention campaign consist of two propositions: how big your problem is; and how to apply the recognized principles of engineering revision and safety education.

The greatest fault of much statistical effort is that it terminates with recording and makes no attempt at an adequate and clear cut explanation. In the interpretation of rates there are two possibilities to be used as a proper basis to which accident occurrence may be referred. The first of these is the result recorded in terms of cost per $100 of payroll. This figure is valueless if there is much fluctuation in wage rates. The second basis is the better, establishing a theoretical 300-day year of ten-hour days and transforming the actual time at work to these terms. There are two objections here: It is not easy to make clear the precise significance of the unit, and its use has been interpreted as

giving official sanction to the ten-hour day as the proper working time.

From man-hours of exposure and accumulated records of accidents the frequency rates can be calculated. In these calculations permanent disability is converted into terms of days lost in order that it may be comparable with temporary disability. Death is usually converted into 6,000 days lost, etc.

Under the present practices of different allowances and varied bases of interpretation it is impossible to make comparisons outside a very limited range. Without comparisons it is impossible to judge the worth of accident prevention activities.—B. L. G.

EMPLOYE SERVICE IN TEXTILE MILLS. *Hosp. Management, Aug., 1924, vol. 18, pp. 62–63, 65.*

Up to the beginning of accident prevention work there was one person killed a day in the steel industry alone. Recently the United States Steel Corporation reported that accidents there have been reduced 56.13 per cent., which means that in one corporation the lives of 35,313 men have been saved during the last sixteen years.

The United States Finishing Company, which operates mills serving the textile industry in Norwich and Sterling, Conn., and Pawtucket and Providence, R. I., has a safety committee which meets monthly to review safety reports. During 1922 there were 1,488 safety recommendations made by members, of which 1,117 were carried out at an expenditure of $10,489.17. Emergency hospitals are established at every factory, under the supervision of registered nurses. Here clinics are maintained where an employee can consult doctors concerning his general physical condition. This service is free.

Most accidents in the plants of this Company—75 to 85 per cent.—are caused by carelessness or thoughtlessness. The most common causes are: struck by falling objects, falls, stepping on or striking objects, careless handling of tools, burns, strains from improper lifting, protruding nails, particles in eyes. Realizing the effect of worry and domestic troubles, the Company has taken various steps to help overcome some of these contributory causes of accidents. One of the outstanding measures is the purchase of a $300 life insurance policy for every employee remaining in its employ for one year, increasing annually with continued employment until a maximum of $500 is reached.—B. L. G.

TEXTILE ACCIDENTS. *Travelers Standard, Oct., 1924, vol. 12, pp. 211–216.*

Forty-four per cent. of the total cost of accidents in the cotton industry, 54 per cent. of those in the woolen industry, and 26 per cent. of those in the silk industry are due to machinery. A table is given showing the sources of accidents to be elevators, power transmission, machine drives, moving parts on machines, and point of operation, with "point of operation" being responsible for by far the greater part of the accidents. Moving belts and parts of machines are second in the cause of accidents. This type of accident can be prevented by the use of proper guards; in this industry there are more guards per employee and the cost of safety is high. The weaver

is subject to the greatest variety of accidents.

In New England many employees are foreign born and safety work becomes at the same time more difficult and more necessary. All efficient and successful organizations have recognized that in this industry the educational and engineering phases of safety work are of equal importance.—B. L. G.

Minimizing Accidents in Cotton Mills. *H. H. Hughes. Nat. Safety News, June, 1924, vol. 9, pp. 23–25.*

The best insurance against accidents in mills is the education of employees in the use of necessary caution. The management must also do its part by removing all possible sources of hazard.

Congestion and poor lighting in a cotton mill are treacherous and should be replaced by large open alleys between machines running across the mill so that light from the windows will shine down the alleys. A freshly painted, well-lighted mill is not so liable to accidents as a dirty, dark, congested "sweat-shop." Ventilation is also an important factor. But to fix everything safe and expect it to stay that way is a sad error. A thorough inspection once a month is absolutely necessary.

Nine personal traits which are contributing factors to many accidents are listed: ignorance of the English language; inexperience; sense defects; timidity and fatalistic outlook on life; tendency toward extreme irritability; carelessness; lack of interest; preoccupation; fatigue.—B. L. G.

The Bond of Safety at Hammermill. *J. M. Sandel. Nat. Safety News, July, 1924, vol. 10, pp. 9–12.*

In the mill of the Hammermill Paper Company at Erie, Pa., every dangerous place and every hazardous occupation has received the greatest possible mechanical protection. Each man has caught the spirit of safety and sees that his fellow employees, particularly the new ones, follow the instructions.

Six per cent. of 1,220 employees were injured during 1923. The severity rate was 0.316 for the year, an unusually low figure.

A complete account of the safety guards and devices, designed by employees and the general safety committee and meeting with the insurance requirements, is included in this article.

The Company feels that safety has enabled the mill to increase its output materially. When employees themselves "want to make the mill safe," accident rates shrink.—B. L. G.

Selling Safety at Pullman. *H. Guilbert. Safety Engin., Sept., 1924, vol. 48, p. 100.*

This Company employs 36,000 people. Its safety bureau has justified its existence as shown by the following figures: The year 1924 shows a decrease of 50 per cent. in the frequency rate over 1923 and a decrease of 33 per cent. in the severity rate over the same year.

At all plants of the Company safety inspectors are maintained, whose chief duties are the elimination of hazards and dangerous practices. There are also adequate dispensaries with doctors and nurses in charge. The most important feature of the Company's safety campaign has been the monthly award of $50 for the three best safety

suggestions. Special guards for dangerous machinery have been designed as a result of these reports. The safety department has developed into a service department, the men bringing their problems to that department.—B. L. G.

THE COST OF ACCIDENTS IN THE TEXAS POWER AND LIGHT COMPANY. *Safety Engin., July, 1924, vol. 48, pp. 11–13.*

The tables given in this article were furnished by C. J. Rutland, Safety Engineer of the Texas Power and Light Company of Dallas, Texas. Table 1 gives the comparative figures for the total payroll and the total accident cost and shows a remarkable reduction in the cost of accidents.

Table 2 gives the average number of employees, the number of hours actually worked by employees, the number of accidents causing loss of time beyond the day on which the injury was received, the number of days lost because of accidents, the number of accidents per million hours worked (the frequency rate). This table also shows a significant decrease in the number of days lost per thousand hours worked as well as in the number of days lost because of accidents.

Table 3 gives the total cost of accidents for the last four years; the figure for 1923 is considerably less than that for 1920.

Table 4 gives the number of accidents involving lost time (one day or more) and the total number of days lost from work. In this table there is no significant improvement since 1920, a fact which is partly explained by the greater activities carried on in the engineering department.—H. B. E.

MINE SAFETY METHODS OF THE FORD COLLIERIES COMPANY. *C. L. Colburn. Nat. Safety News, July, 1924, vol. 10, pp. 31–32.*

Prevention of accidents has a fundamental influence on mining; safety comes first, quality of production second, and cost third. Safety promotes efficiency, loyalty, and contentment. Every man on the job should become a safety worker.

During 1923 the Ford Collieries Company, owing to accidents, lost 20,440 man-hours out of 2,042,075 man-hours worked—about 1 per cent. There were 153 lost-time accidents but only fifty-four were compensable. There were no fatalities, total disabilities, nor permanent partial disabilities.

Proper accident statistics are kept, the mining organization is the safety organization, and every man is responsible to his immediate superior for safety in his department. Of particular benefit is the system of substandard inspection. One day each month the assistant foremen are changed from their particular sections to some other sections, and on this particular day each one is required to present a report mentioning every substandard condition that he has observed. No man is given a bad mark for having substandard conditions in his section, but if he does not recognize them in some other section he is severely criticized.

A corps of first-aid men for mine rescue and fire fighting is maintained. A motor ambulance for underground use is stationed at each mine. It was

designed by men on the job and is known as the Franklin mine motor ambulance. It has room for two stretchers and a large cabinet containing first-aid equipment. A motion picture projector is also part of the safety equipment, and liberal use is made of the films of the United States Bureau of Mines and of the National Safety Council.—B. L. G.

First Aid in Mining Practice. *T. L. Llewellyn. Colliery Engin., Sept., 1924.*

In this paper the general principles of first-aid treatment in mines is laid down and a specific scheme for the use of a colliery employing 1,000 men is given. The organization of personnel, the equipment, the quantities of fittings and stores are given. In order to emphasize the importance of prevention, a calculation has been made of the amount of time lost in Great Britain from accidents. Much of this time is, of course, unavoidable but the author thinks a saving of 10 per cent. might be effected. He has estimated that 10,000 working years is lost yearly in Great Britain from accidents in the mines alone. The importance of a safety-first campaign and, above all, of attention to trivial injuries of the eyes is dealt with. A specification of an ambulance box devised for underground work is given and the advisability of putting up dressings in sealed packets sufficient for one dressing alone, in order to avoid waste of contaminated dressing, is advocated. The general rules for ambulance practice are summarized in a few sentences which are said to contain "the whole of first-aid treatment."

Golden Rules of First-Aid Practice

Attend to the accident on the spot.
Stop bleeding by pressure.
Cover all wounds at once.
Be gentle, quick, and cool.
Prevent all unnecessary movement by steadying, fixing and supporting the injured limb.
Keep the patient warm.
Provide easy method of removal.
Avoid unnecessary interference.

The use of the Thomas hip splint for all fractures of the leg is strongly advised.

An Underground Safety Story of Zinc. *G. E. Wallis. Nat. Safety News, June, 1924, vol. 9, pp. 11–14.*

The New Jersey Zinc Company has proved that safety in mining is not only possible and an efficiency factor, but that no industrial problem is too perplexing to be solved by good engineering and common sense. At the Franklin mine, "Safety" is not just a word on a poster; rather it has become the most important factor in the job of every employee. The shift boss is the safety inspector, and compound rewards can be earned for no lost-time accidents on his shift. No device which will effectually protect employees from injury has been neglected. Working conditions are of the best; fresh air and water are available anywhere. Measures for preventing and fighting mine fires are thorough and efficient. Watchmen with time clocks cover the entire mine on continual fire inspection tours. In addition to the mine pumps there is also a separate system connected with a reservoir for emergency use. Worthy of particular mention is the special five ply, wrapped, tire fabric hose. On every gang there is at least one rescue squad

man and one first-aid man, each thoroughly trained.

In the mill, a dust collecting apparatus is installed. Before its installation the dust collecting system showed 33.4 mg. per cubic foot of air; after its installation, 0.92 mg. Over 97 per cent. of the dust is recovered and shipped to the smelter to make zinc oxide.—B. L. G.

AN ANALYSIS OF ONE HUNDRED ACCIDENTS ON POWER PUNCH PRESSES WITH SUGGESTIONS AS TO THE INSTALLATION OF SUITABLE GUARDS ON SUCH MACHINES. *N. Y. State Dept. Labor, Special Bull., No. 131, 1924, pp. 27.*

The power punch causes more accidents to the fingers of employees than any other machine in modern industry. Of the 100 accidents investigated ninety-five occurred at the point of contact. Eighty-nine of the accidents occurred to males. The total losses resulting from these accidents amounted to 144 digits. Among the males 42 per cent. were under 25 years of age. The index finger suffered to a greater degree than any other, and this is the finger that is usually considered as the most important.

Ninety of the accidents occurred in the course of the operator's regular work, but ten were due to other reasons. Two were caused by fellow employees inadvertently tripping the presses, and one was the result of a box falling on the treadle of the press, causing it to trip. In the judgment of the safety inspectors, 90 per cent. of all the accidents could have been prevented by the use of proper and efficient guards.

The following measures for preventing accidents on this machine are suggested: the use of efficient guards, a guard for the foot pedal; periodic inspection of moving parts; the use of hand trips so that the operator must remove his hands before the press is tripped; and proper artificial lighting.—B. L. G.

INDUSTRIAL EYE HAZARDS. *J. Boone. Manufacturers News, Oct. 11, 1924, vol. 26, p. 12.*

Education of both employers and employees offers the greatest possibility for the elimination of unnecessary eye hazards. There will, however, always be the type of employer who will not properly discharge responsibilities along safety lines unless he is forced. This power of coercion is, of course, that of the state, but many states do not yet recognize that the prevention of accidents is one of their moral and economic obligations. The machinery of the state best suited to the formulation and administration of industrial safety regulations seems to be an industrial commission with full power to make and administer rules which may be varied from time to time to meet the changes in industrial conditions. Laws made by a legislature which only meets once in two years are often impracticable and inapplicable to modern conditions. That "it is cheaper to prevent accidents than to pay for them" is a fact that must be brought home to industrial managers until they firmly believe it.

The employee also offers a problem. False pride and inertia to something new are responsible for the neglect in many cases of safety measures such as goggles, etc. Efforts in this direc-

tion are divided into two phases: first, a year-round campaign for the prevention of eye accidents; and, second, special efforts to sell the goggle to the hard-boiled workman. These are the conclusions of the National Committee for the Prevention of Blindness.—B. L. G.

EYESIGHT CONSERVATION IN INDUSTRY. *F. E. Burch. Indust. Doctor, Sept., 1924, vol. 2, pp. 142–146.*

The blind population of the United States numbers 110,000, 13.5 per cent. of whom are blind as a result of industrial accidents. The means of eyesight conservation in industry summarized briefly are: (1) education; (2) illumination; (3) vision testing and correction of visual defects by glasses; (4) prompt and efficient medical service; (5) protection of the eyes themselves.

Uncorrected vision ranks second among physical defects found in a systematic examination of the employees of many plants. Faulty illumination causes 15 per cent. of all factory accidents and research statistics show that night accidents are relatively more frequent than day accidents, for artificial lighting weakens and fatigues the eyes.

Treatment of any eye injury, no matter how trivial, should be "apply an eye ointment, cover with sterile gauze, put on a Red Cross bandage, and send to the nearest oculist."

As practical means for diminishing eye accidents, the following are recommended:

1. By collective statistics aid the National Safety Council and such organizations in the more exact determination of relative causes of eye disabilities.

2. Secure uniform laws regarding safety provisions, illumination tests, and enforcement of such.

3. Recommend uniformity in the state compensation for eye injuries.

4. Encourage examination of vision before employment.

5. Secure legislation providing additional penalties for failure to provide protection against eye hazards and lessening compensation to employees suffering injury as the result of failure to use the protection provided.—B. L. G.

THE PREVENTION OF EYE ACCIDENTS IN THE UNITED STATES STEEL CORPORATION. *H. Schultz. Safety Engin., June, 1924, vol. 47, pp. 322–324.*

The activities of the United States Steel Corporation in the prevention of eye injuries have been governed by three fundamental factors: the guarding of the eyes with suitable eye protectors, the installation of safeguards to protect the eyes, and the education of the workers in the preservation of their eyes.

Considerable care has been used in the selection and purchase of goggles and other types of eye protectors, and each of the subsidiary companies has made a prolonged and careful study of the eye hazards peculiar to the various occupations of the operations in steel making. The records of the past year show that the average number of pairs of goggles in use in the corporation plants was over 44,000—about one pair to every five or six men. These are furnished free of cost. Wherever it has been possible, the use of goggles has been done away with by the installation of safeguards of various types.

In order to increase the efficiency of the foregoing measures, educational campaigns against eye accidents have been organized. Because of these activities eye accidents throughout the corporation have been reduced nearly 60 per cent. in the past ten years and 6,300 men have been saved from this type of injury.—H. B. E.

"Paying the Price." *Travelers Standard, May, 1924, vol. 12, pp. 111–117.*

This article gives a description of a moving picture film showing the dangers of a neglected infection. The Travelers Insurance Company has produced this film for the purpose of having it exhibited to different groups of employees in various industrial plants. This film is intended for free distribution and requests should be sent to the Director of Technical Research, Care of The Travelers, Hartford, Conn.—H. B. E.

Safety Code for Forging. *Nat. Safety News, June, 1924, vol. 9, pp. 55–61.*

Safety Code for Laundry Machinery and Operations. *U. S. Bur. Labor Statistics, Bull. No. 375, Oct., 1924, pp. 12.*

Mechanical Refrigeration. *Safe Practices Pamphlet No. 61, Nat. Safety News, July, 1924, vol. 10, pp. 44–52.*

INDUSTRIAL SURGERY

Handicaps of Industrial Surgeons. *A. W. Moore. Hosp. Management, Sept., 1924, vol. 18, pp. 88, 90.*

The industrial surgeon must please the injured, satisfy the employer, and remember the insurance carrier. He must, therefore, be a good general surgeon, be a student of medical jurisprudence, and have an understanding of human nature. The company doctor is often an object of suspicion to the injured, to his family, and to his friends. He must in some manner acquire their confidence. Often this is best done by suggesting that the family doctor be called into consultation. In head injuries, internal injuries, and fractured bones, a thorough study of the patient should be made before resorting to surgery.

The office of an industrial surgeon should contain a complete X-ray outfit, a physiotherapy outfit, and an efficient office force. His business should be carried out in a business-like way, his patients treated as all injured persons would be treated by professional men; then no form of regulation need be feared.—B. L. G.

The Problem of the Industrial Lame Back. *R. B. Osgood and L. B. Morrison. Abstr. as follows from Boston Med. and Surg. Jour., Aug. 28, 1924, vol. 191, p. 381, in Jour. Am. Med. Assn., Sept. 27, 1924, vol. 83, p. 1028.*

Osgood and Morrison are of the opinion that a preemployment physical examination by a physician who knows not only his medicine but his mechanics would greatly lessen the numbers of back cases in industry.

The labor unions should look on this not as an affront but as an opportunity. Skilled and experienced interpretation of meticulously taken roentgenograms by roentgenologists and surgeons familiar with the clinical pictures is the most valuable single aid in disproving, suggesting, confirming or establishing the diagnosis made by careful history and physical examination. The stereoscope and the Bucky diaphragm have become technical necessities. Ability to estimate and evaluate the extent to which psychic factors enter, routine method of examination of the patient, and skill in interpreting the findings of this examination acquired by clinical experience and anatomic knowledge are the essential prerequisites in solving the knotty problems of the lame back in industry.—K. R. D.

LOW BACK STRAIN, WITH PARTICULAR REFERENCE TO INDUSTRIAL ACCIDENTS. *E. G. Brackett. Jour. Am. Med. Assn., Oct. 4, 1924, vol. 83, pp. 1068–1074.*

The object of this paper is to call attention to the important rôle that recognizable physical defects and anomalies play in causing long persistent or prominent disability under the stress incident to normal labor, and to the necessity of taking steps to safeguard against the occurrences.

Back strain may be considered in relation to the character of the violence causing the injury (severe muscular exertion on the part of the subject or external mechanical violence), and in relation to the condition existing in the spine at the time of the injury. From this second point of view, back strain may be classed as those in which violence occurs:

1. In normal spines, in which the result is a purely ligamentous or aponeurotic strain, not associated with bone injury.

2. In normal spines, in which the result is a fracture of some part of the vertebral column.

3. In spines that are already the seat of pathologic change (usually osteo-arthritis) and in which the results are, therefore, ligamentous or aponeurotic strains, plus some damage to the spine, which in itself is not normal.

4. In spines the seat of structural anomaly (usually in the lumbosacral area) and in backs potentially weak, and therefore less resistant to violence.

The author discusses with some detail and illustrates with case reports these different types of back injury.—K. R. D.

TRAUMATIC AND INDUSTRIAL HERNIA. *J. P. Kaster. Southwestern Med., Oct., 1924, vol. 8, pp. 461–464.*

The subject of traumatic hernia is of vital importance to every industrial organization. There has been no definite attempt made to standardize our knowledge of this injury in regard to its etiology. Traumatic hernia can occur only when there is a rupture or tearing of the abdominal wall, fascias, or muscles. All other hernias are congenital. Few hernias are due to direct violence at the point where the hernia developed. When traumatic hernia does develop, it is not usually found at the site of normal hernia openings. The hernial sac, as ordinarily seen, is congenital and not due to trauma. If hernia does result from trauma we must have the physical evidence of the injury. Also the injury will be sufficient to incapacitate

the patient at once: there will not be the history of a slight pain in the inguinal region, and, weeks or months later, the sudden discovery of a lump or sac in the scrotum.—B. L. G.

INJURIES TO THE TESTICLE. *A. M. Dickinson. Indust. Doctor, Sept., 1924, vol. 2, pp. 137–138.*

Industrial physicians frequently have to treat a patient suffering with a swollen testicle which is attributed to some injury received in the course of employment. Enlargement of the scrotum may be due to many causes; the most common are hernia, traumatic orchitis, torsion of the spermatic cord, gonorrheal epididymitis, tuberculous epididymitis, syphilitic orchitis, tumors of the testicle and hydrocele. The history, size of the swelling, and the amount of pain varies in individual cases.

A chart showing the principal points of the diagnosis of injuries accompanies the article.—B. L. G.

EXTENSIVE SUPERFICIAL BURNS. *G. W. Shepard. Abstr. as follows from U. S. Naval Med. Bull., June, 1924, vol. 20, p. 697, in Jour. Am. Med. Assn., Aug. 9, 1924, vol. 83, p. 474.*

The open-air treatment of burns is looked on with favor by Shepard. The management by the open-air method consists in placing the patient in bed between sterile sheets without any dressing. A cradle supports the blankets and the temperature within is maintained at 105°F. by electric light bulbs. Sterile liquid petrolatum is applied to the burned areas three times daily. The patient is treated in this manner during the entire course and disturbed as little as possible. Very little pus appears and the crusts keep soft and are easily removed and with little pain. It has for its advantages, simplicity, minimum disturbances of the patient, minimum of suppuration, and a minimum amount of scar tissue.—K. R. D.

EXPERIMENTAL RESEARCH ON DEATH FROM BURNS. *J. Olbrycht. Abstr. as follows from Rev. de méd., 1924, vol. 41, p. 81, in Jour. Am. Med. Assn., Nov. 29, 1924, vol. 83, p. 1802.*

Olbrycht relates that only in the suprarenals were anatomic changes found after primary severe burns in man and animals. The intensity of the hyperemia and ecchymoses, reduction or total loss of chromaffin substance and lipoids in the suprarenals, seem to depend on the extent of the burned area and the age of the subject, most pronounced in the young. In five fatal clinical cases and two rabbits and three dogs, all dying from the effects of burns, the epinephrine content of the suprarenals was low or totally absent. The Abderhalden reaction was pronounced with suprarenal substance. The suprarenals displayed the same type of changes as in anaphylactic shock and peptone intoxication. He ascribes these changes to a toxic action from decomposition of protein in the burned tissues. The practical conclusion is the necessity for clearing out the devitalized proteins in the burned area, and the necessity for stimulating suprarenal function or substituting it with epinephrine.—K. R. D.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

REPORT ON THE NUTRITION OF MINERS AND THEIR FAMILIES. *Med. Res. Council, Special Rep. Series No. 87, London, 1924.*

This is a report by a very strong committee on the nutrition of the families of miners during a period of serious industrial depression (1922–1923). Questions had been asked in the House of Commons as to whether the children of miners were getting enough food, and this committee was appointed to investigate the subject.

The report starts with a full description of the food requirements of man and the methods of measurements of energy requirements. This section is most valuable and embodies the latest work on the subject.

The ordinary human worker has a daily (eight-hour) output of between 80,000 and 90,000 kilogrammeters. The day may be divided into three periods of roughly eight hours each—sleep, free time, and work.

	Calories
Eight hours' sleep at 62 calories per hour	496
Eight hours' work at 68 calories (basal) per hour + 200 calories × 4 (for work increment)	1,344
Eight hours' free time at basal + 75 per cent	952
	2,792

This figure should be increased by 10 per cent. to allow for loss between purchase and digestion of food. The total number of calories required is still under 3,100.

In the study of family budgets it is necessary to assess the women and children in the terms of "man," and a table is given in which a woman is valued as 0.83, a child of 11 as of equal value, a child of 8 as 0.6 and one of 4 as 0.5. Boys over 13 require as much food as a man.

In the investigation a complete analysis of the budgets of 140 families for one week in five distinct colliery districts was undertaken. The mean family weekly income was 64s. 3d., of which 54.9 per cent. was spent on food. The mean caloric value of the diet was 3,035 and the cost per "man" was 6s. 6½d. a week. It was found that when the wife had been a domestic servant the standard was higher. The heights and weights of the children were also taken; in the case of Durham they were compared with the standard of the whole county and found to be deficient.

The conclusions were that most of the families were in debt and living was difficult. In some of the families the amount of money allowed the wife bore no relation to the wage earned. In Derbyshire the average consumption of food was sufficient, and the children of the miners compared favorably with the standard of the whole county. In the other four districts the energy requirements fell below a satisfactory standard.—T. L. L.

THE FOOD REQUIREMENTS OF COAL MINERS. *K. N. Moss. Abstract of Paper Read at Annual General Meeting of the Institution of Mining Engineers, London, Oct., 1924.*

Professor Moss, of Birmingham, criticizes strongly the contention of the Committee on the Nutrition of Miners

(see preceding abstract) that a dietary of 3,400 calories (gross) is more than sufficient for the average miner. As a result of his own investigation Professor Moss is convinced that the Committee has greatly underestimated the requirements of the miner and that if this standard were introduced in a national emergency the physique of the miner would suffer and the output of coal would be reduced. He quotes in support the results obtained by a Research Committee of the Army Medical Advisory Board (1906). The report of the Committee on Nutrition dealt with a period of depression when the miner was unable to obtain enough wages to feed himself well.

Professor Moss thinks a hard working collier requires 4,711 calories a day and states that the output is much above the Committee's estimate of 80,000 kilogrammeters a working-day. His own estimate is 17,000 kilogrammeters an hour.—T. L. L.

MUSCULAR EXERCISE, LACTIC ACID, AND THE SUPPLY AND UTILISATION OF OXYGEN. *A. V. Hill, C. N. H. Long, and H. Lupton. Proc. Roy. Soc. B., 1924, vol. 97, pp. 83–138.*

The authors, after discussing the technic of the Douglas bag, proceed to deal with the recovery process after exercise in man. Experimental evidence is reported which shows that after moderate exercise recovery is rapid and practically complete in a few minutes, but after severe exercise, although the same rapid phase occurs, a protracted process follows which continues for eighty minutes after the end of exercise. Moderate exercise is distinguished from severe exercise by the presence or the absence of the protracted recovery process. The rapid phase is the oxidative removal of lactic acid in the muscles where it was formed. The protracted phase represents the oxidative removal of lactic acid which has escaped from the muscles where it was formed, owing to the inadequacy of the oxygen supply to effect its immediate removal. After severe exercise the oxygen intake remains at a level, about 7 per cent. higher than before, even after eighty minutes. The "efficiency" of recovery in man is found to have a mean value agreeing with that determined for isolated frog's muscle. The time course of recovery while breathing oxygen-enriched air at rest is not appreciably different from that while breathing atmospheric air or even lower oxygen pressures.

Further work is next described which is concerned with the oxygen debt at the end of exercise. Only 5 per cent. of the oxygen debt is due to extra circulatory and respiratory effort associated with recovery; the rest is ascribed to the restoration of lactic acid to its precursor. The oxygen debt after moderate exercise is small, since the oxygen supply is adequate for removing the lactic acid formed; but after severe exercise it may be considerable, and represents a concentration of lactic acid in the active muscles of from 0.2 per cent. to 0.5 per cent. Breathing oxygen allows a considerable *increase* in the oxygen debt; the subject can undertake a greater effort before being stopped by distress. Voluntary muscles are likened to an accumulator of fairly high capacity and low internal resistance; they can discharge a large amount of energy for

a short time at a high rate, which is restored later during the slow process of recharging.

The paper closes with an appreciation of the work of Hartley Lupton, one of the authors, who unfortunately died before publication.—E. L. C.

RELATIVE INFLUENCE OF MENTAL AND MUSCULAR WORK ON PULSE RATE AND BLOOD PRESSURE. *R. D. Gillespie. Abstr. as follows from Jour. Physiol., May, 1924, vol. 58, p. 425, in Jour. Am. Med. Assn., Aug. 9, 1924, vol. 83, p. 476.*

Gillespie's studies showed that mental work produces an increase in pulse rate and blood pressure. The increase is independent of emotional factors. The increase is not accounted for by movements of the articulatory muscles, or by known muscle tensions. In combined mental and muscular work, the increases in pulse rate and blood pressure are greater, as a rule, than in mental or muscular work performed singly. In the case of women students, the pulse rate increased proportionately twice as much as the blood pressure; whereas in male students, the proportionate increases in blood pressure and pulse rate were fairly similar.—K. R. D.

THE WORKING DAY IN JAPANESE MINES. *Internat. Labour Office, Indust. and Labour Information, July 21, 1924, vol. 11, pp. 118–119.*

Work in Japanese coal mines is usually carried on both day and night. The average worker has a ten-hour day, although as low as eight and as high as twelve hours are common.

The rate of attendance is of particular interest. Long hours of work, together with the insufficiency and badness of the air, have a telling effect. Most male workers are on duty only fifteen days out of a month, and the rate for female workers is even less. The reasons for absence are shown in the following chart.

REASON FOR ABSENCE	MALE	FEMALE
	%	%
Sickness or injury due to work	5.4	4.0
Other sickness or injury	7.1	10.2
Absence of working companion	2.2	4.9
Family reasons	6.0	14.3
Absence from mine	2.7	1.6
Owing to condition of place of work	1.7	1.9
Other reasons	8.1	8.3
Total percentage of absence	33.2	45.2

—B. L. G.

STANDARDS OF MEASUREMENT OF TEN THOUSAND MALE WORKERS: PRELIMINARY NOTE, WITH SPECIAL REFERENCE TO RACIAL FACTORS. *L. R. Thompson and R. H. Britten. Am. Jour. Pub. Health, May, 1924, vol. 14, pp. 383–390.*

If physical measurements and records are to be used at all in the study of industrial conditions, the factor of race must be considered in this country. This particular study is limited to males, and all results point to the racial factor as being of prime importance; the low average of one race may be low because part of the race labor under adverse industrial conditions, while the average of another race may not be so affected.

The tendency of certain races to be employed in specific industries is mentioned. Charts and tables are given

which contain comparative measurements of different races as to number of workers, average height and average weight by race, blood pressure, and pulse rate, and percentage of normal vision by race. Final emphasis is placed on the fact that general physical examinations have definite limitations in the interpretation of industrial conditions.—B. L. G.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

CAISSON DISEASE. *J. C. Sjöblom. Abstr. as follows from Finska Läkaresällskapets Handlingar, Helsingfors, June, 1924, vol. 66, p. 398, in Jour. Am. Med. Assn., Aug. 23, 1924, vol. 83, p. 654.*

Sjöblom states that the divers' paralysis in one of the two cases he describes improved to such an extent that the man is able to walk on level ground, but tires readily. In the second case the spastic paralysis has persisted unmodified; the urine is infected and there is severe obstipation. The man was allowed 100 per cent. workmen's compensation for life. Both were young, robust men. In the first case the paralysis came on gradually in four hours after the worker had returned to the surface rather more rapidly than usual. Treatment was with potassium iodide, hexamethylenetetramine, massage and tepid baths; in less than a month he was walking with crutches.—K. R. D.

INFLUENCE OF VEGETATIVE NERVOUS SYSTEM AND OF FATIGUE ON SUSCEPTIBILITY TO ELECTRIC CURRENTS. *G. Aiello. Il Lavoro, July, 1924, vol. 15, pp. 210–212.*

In animals after administration of adrenaline susceptibility to electric currents was lessened by about 27 per cent. Atropine caused the same diminution (28 per cent.). Pilocarpine increased the susceptibility 20.9 per cent. Fatigue markedly increased the susceptibility.—J. W. S. B.

WOMEN AND CHILDREN IN INDUSTRY

WOMEN IN MISSOURI INDUSTRIES: A STUDY OF HOURS AND WAGES. *U. S. Dept. Labor, Women's Bur., Bull. No. 35, 1924, pp. 127.*

The Missouri legislature, in 1921, passed a resolution appointing nine people to act as the Minimum Wage Commission. The aid of the Women's Bureau was requested and the bulk of the work was done by that organization. Agents of this Bureau copied figures from payrolls in factories of twenty-two towns of over 10,000 inhabitants; other necessary information was obtained from the respective managements; a few workers were visited in their homes to confirm data concerning home responsibility and dependents.

As an industrial state Missouri stands eleventh on the list. Clothing employed by far more women than any other industry. Of the women investigated in 174 varied establish-

ments 16,403 were white and 1,536 were colored, the total representing about one-fourth of the women employed in the entire state.

The conclusions of this investigation are as follows:

Hours.—Missouri has a nine-hour day standard and a fifty-four-hour week. Less than one-tenth of these women were required to put in a full fifty-four-hour week; almost one-third had a regular forty-eight-hour week or under.

Wages.—One-half of the white women earned less than $12.65 a week; half of the negro women earned under $6 a week.

Lunch Periods.—The time permitted for lunch varied from thirty minutes to one hour.

Nativity.—Native-born white women constituted 80.8 per cent. and native colored women 13.2 per cent.; only 6.0 per cent. were foreign born.

Age.—Of the 9,582 white women reporting, the largest group (23.9 per cent.) was between 20 and 25 years of age; of the 773 negro women reporting, the largest group (28.1 per cent.) was between 30 and 40.

Conjugal Condition.—Of the 9,699 white women reporting, 63.6 per cent. were single, 20.2 per cent. married, and 16.2 per cent. widowed, separated, or divorced. Only 27.1 per cent. of the 746 negro women reporting were single, 45.2 per cent. married, and 27.7 per cent. were of the third class.

Living Conditions.—Of the 9,924 white women supplying this information only 12.6 per cent. were living independently; "living at home" or "with relatives," however, does not necessarily mean lessened responsibility, for many of these workers were helping to support their families or their relatives.

Included in this report are many general tables and schedule forms regarding industrial women in Missouri; there are also charts based on the cost of living for women employed in St. Louis during the autumn of 1922. —B. L. G.

CHILD LABOUR IN SHANGHAI. REPORT OF MUNICIPAL COMMISSION. *Internat. Labour Office, Indust. and Labour Information, Oct. 6, 1924, vol. 12, pp. 5–7.*

The Commission investigated the present conditions of child labor in Shanghai. The results are astounding. A child begins to work in the mill or factory as soon as he is of any economic value to the employer. Many children are not more than 6, usually working twelve hours a day with only one hour for meals. Night work is as common as day work. The average wage is not more than 20 cents a day, and the contract system of employment is prevalent. Many contractors obtain children from the country districts, paying the parents $2 a month for the services of each child, and hire the children out at $4 a month. The children are most miserably housed and fed, and they receive no money. Their conditions of life are practically those of slavery.

Some recommendations have been made, but reform is difficult as there is no central government to enforce decrees; the foreign settlement is managed by the Municipal Council. Births are not registered and the age of children cannot be proved. Educational facilities are lacking, there is no factory inspection, and owing to

the present economic and social condition of China the children are sent to work by their parents as early as possible.—B. L. G.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

ARTIFICIAL DAYLIGHT. *L. C. Martin. Abstr. as follows from Nature, 1924, vol. 114, pp. 53–55, in Chem. Abstr., Oct. 10, 1924, vol. 18, p. 3009.*

The gas-filled W lamp with color filter is a most suitable source of artificial daylight. One type has the lamp enclosed in a lantern with a reflector, the light passing through a color filter. The glass is colored by varying proportions of cobalt, manganese, nickel, and copper. A well-designed reflector is important. A second type reflects the light from a surface colored with patches of blue, green, and red or yellow pigments in definite proportions of area. The actual correction in all daylight lamps is good over the brightest part of the spectrum (between 0.45 and 0.65 μ), very deficient in violet, and gives too much energy at the extreme red end of the spectrum. A third type employs a simple colored (blue) bulb. Such lamps give a better sense of relative value to blues and greens, but are not useful for exact work. The "higher efficiency" and less fully corrected lamps are applied with success for the lighting of shop windows, etc. The daylight lamp is not receiving the attention in England that it is in the United States.—P. D.

PROPER PAINTING AS AN AID TO INTERIOR ILLUMINATION. *W. Sturrock. Nat. Safety News, June, 1924, vol. 9, pp. 31–33.*

ILLUMINATION AND PROPER PAINTING OF INTERIORS. *W. Sturrock. Nation's Health, Aug., 1924, vol. 6, pp. 525–527.*

Paint on walls and ceiling, if properly chosen, may increase illumination on working surfaces four or five-fold. Shadows are softened, glare is lessened. The author also discusses choice of colors and surface. The articles are fully illustrated.—C. M.

THE MINIMUM OF AIR CONTAMINATION IN INDUSTRY. *Nation's Health, June, 1924, vol. 6, pp. 410–411, 434.*

This is a survey by the research section, Division of Industrial Hygiene, New York State Department of Labor, of fifty-two factories in New York City having fifty-nine gas engine installations. Of this number of gas engine installations, twenty-six were found to have "hot tube ignition" instead of electric spark.

The investigation has developed the fact that a well-maintained gas engine installation in a basement not used for manufacturing purposes or in a suitable engine room on the ground floor is perfectly acceptable from a hygienic standpoint and is of great value to the manufacturer in power cost economy. On the other hand, when an engine is situated openly in a workroom on the upper floors of a building there are many features connected with its operation that are inimical to health, and therefore its use cannot be recommended in workrooms.

Ignition should be effected by an electric spark, not by the gas flames.

There appears to be more danger that the engine will backfire when the hot tube is used than with the electric spark.

That portion of the sheet metal flooring which is used as a walk should be protected with grooved planks to prevent accidents from slipping.

Flywheels should always be kept carefully guarded.

Exhaust gases should be prevented from backing into the workroom.—P. D.

THE USE AND SIGNIFICANCE OF THE KATA-THERMOMETER. *H. M. Vernon. Fourth Ann. Rep. Indust. Fatigue Res. Board to Dec. 31, 1923, pp. 47–54.*

This portion of the report contains a description of the kata-thermometer and discusses practical precautions to be taken in using the instrument in ventilation work. The author recommends the use of a tripod with adjustable legs and a suitable clamp for holding the kata-thermometer.

The necessity of taking frequent observations over long periods, in places such as workshops, is pointed out—otherwise the results have little significance.

The usefulness of the dry kata in measuring air velocities less than 300 feet per minute is pointed out, and a new instrument based on the hot-wire anemometer principle is described. By means of this, anemometer fluctuations in air currents can be measured. Whether mild air currents fluctuating in magnitude are beneficial or not is, as yet, undecided, but a temperature of 60° to 65°F. appears to be most suitable for light industrial work. (Wet bulb temperatures are not given.)—P. D.

THE PHYSIOLOGICAL STANDARDIZATION OF THE KATA-THERMOMETER. NINTH REPORT TO THE COMMITTEE ON THE CONTROL OF ATMOSPHERIC CONDITIONS IN HOT AND DEEP MINES. *K. N. Moss. Abstract of Paper Read at Annual General Meeting of the Institution of Mining Engineers, London, Oct., 1924.*

In this paper Professor Moss calls attention to the danger of using, in hot mines, the standards laid down by Prof. Leonard Hill. Professor Moss points out that work can be done in a hot and deep mine, with a wet kata cooling power of 7, once men have been acclimatized to the conditions, and that in the deep working of the Pendleton Colliery the men working in a temperature of 100.5°F. dry bulb, wet bulb, 86.5°F., wet kata cooling power 4, turned out as much coal as in the more shallow portions of the pit.

In the discussion which followed the reading of this paper Prof. Leonard Hill protested against the use of his standards in conditions for which they had not been intended, and said that his standards were drawn up for a definite range of temperature and wind pressure, and it was wrong to use the standards beyond this limit.—T. L. L.

HEAT GIVEN UP BY THE HUMAN BODY AND ITS EFFECT ON HEATING AND VENTILATING PROBLEMS. *C. P. Yagloglou. Jour. Am. Soc. Heating and Ventil. Eng., Aug., 1924, vol. 30, pp. 597–609.*

The writer has taken pertinent data

from Lefèvre, L. Hill, Rubner, Voit, Wolpert, and Benedict, and converted their figures into B.T.U.'s (British Thermal Units). The Du Bois formula and derived curves are all given in B.T.U.'s per square feet of body surface per hour.

To these data the author adds others determined in his laboratory at higher effective temperatures. Curves are given showing heat loss in B.T.U.'s per square feet per hour against effective temperatures, while another curve shows heat production against effective temperature. Using Benedict and Cathcart's data on heat elimination with work, a third curve is plotted. The author shows the fundamental nature and practical utility of these curves in estimating ventilation requirements.—P. D.

Action of Chimney Gases. *J. Stoklasa. Abstr. as follows from Med. Klin., May 18, 1924, vol. 20, p. 678, in Jour. Am. Med. Assn., June 28, 1924, vol. 82, pp. 2149–2150.*

Stoklasa describes the noxious action of chimney gases on vegetation and animals. Sulphurous acid and sulphur dioxide are the main agents. Coniferae (fir, etc.) cannot thrive in large cities, and the chlorophyl is poisoned also in the country in the neighborhood of coal-burning industries. In every large European city a man takes in, by breathing, every day 25 c.c. (71.5 mg.) of sulphur dioxide. The author asks for legal protection against these gases.—K. R. D.

Economy through Smoke Abatement. *H. B. Meller. Indust. and Engin. Chem., Oct., 1924, vol. 16, pp. 1049–1051.*

This is a brief summary of some of the data obtained in the recent smoke abatement investigation carried out in Pittsburgh by the Mellon Institute. The data show enormous deposits of solid material in large cities. Legislation thus far has been directed toward the abatement of dense smoke only and this represents a very small portion of the nuisance.

Comparative data between Pittsburgh and London are given.—P. D.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

Medical Inspection of Industries. *E. R. Hayhurst. Am. Jour. Pub. Health, May, 1924, vol. 14, pp. 379–382.*

The purpose of the medical inspection of industries is to bring the knowledge of the medical man to the benefit of industry. The presence of a "preventive medical man" is not sought, but the man who can distinguish the causes of industrial diseases, who can go into a factory and point out health hazards, and who can detect biologic misfits among employees at given processes is much in demand. The industrial physician is a trained man whose education is at least on a par with that of the employers and managers. We have then a man who can advise with the engineer in heating, lighting, and ventilating; with the chemist in regard to the handling of poisonous substances; with the employment department in the matter of

selection, turnover, and replacement of personnel; with the legal department in the matter, not only of compensation questions, but of labor controversies; and with the production department in the matter of getting out a greater percentage of human effort.

In Great Britain and Belgium there are good systems of medical inspection from a governmental point of view; why not in America? The problem is, as is usually the case, not the large corporations, but rather the smaller industries; it is time the government assumed responsibility for the factory that is negligent and irresponsible in these matters.—B. L. G.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

PERCENTAGE VISUAL LOSS IN INDUSTRIAL CASES—A SUGGESTED TABLE. *L. H. Weinheimer. Indust. Doctor, Nov., 1924, vol. 2, p. 174.*

The compensation law needs some kind of chart in simplified form to present losses of vision in such a manner as to be readily understandable and interpreted. The following chart gives a fair basis of losses ranging from 20/20 to 20/100, which the commission has accepted as industrial blindness. This table is concerned only with central vision and is based wholly on the Snellen chart.

20/20	normal vision
20/30	16 per cent. loss
20/40	32 per cent. loss
20/50	48 per cent. loss
20/70	64 per cent. loss
20/100	80 per cent. loss

If such a table were adopted, the commission could render decisions easily and uniformly.—B. L. G.

COMPENSATION FOR SILICOSIS. *F. L. Hoffman. Indust. Doctor, July, 1924, vol. 2, pp. 103–106.*

This article was originally published in *The Spectator* and is a presentation of Dr. Hoffman's reasons arguing for the inclusion of silicosis among the occupational diseases scheduled in a bill recently before the New York State Legislature. After discussing with some detail the fact that the Union of South Africa has successfully coped with and administered a compensation act including silicosis with other industrial diseases and that Great Britain apparently has been doing the same during the past few years, Dr. Hoffman gives a number of interesting facts and conclusions derived from his study of the granite-stone industry of Vermont and from a report of the British Home Office on the grinding of metals and cleaning of castings. Besides stating that his own work established the correlation between the trade life of the workmen and the prospective incidence of fibroid phthisis, he gives some interesting statistics derived from the report of the British Home Office. Of 495 wet sandstone hand grinders, the average age was 36.87 years, the average duration of employment, 21.49 years, and the average chest expansion 2.31 inches. The proportion showing evidence of fibrosis was 73.97 per cent., the proportion showing definite evidence of phthisis was 7.1 per cent., additional cases showing suspicion of

phthisis, 14.1 per cent. For wet sandstone machine grinders the proportion showing evidence of fibrosis was 37.5 per cent., for dry sandstone grinders, 38.8 per cent., for dry manufactured wheel-hand grinding, 21.1 per cent., for cutlers, 17.2 per cent., and for machine grinders on manufactured wheels, 5.2 per cent. The investigation also included dressers of castings, or what in this country would be called foundry workers, based on 201 examinations, with a proportion of fibrosis of 22.4 per cent.—H. B. E.

REHABILITATION OF DISABLED EMPLOYEES

REHABILITATION OF THE PHYSICALLY HANDICAPPED. *R. M. Little. Jour. Am. Med. Assn., July 12, 1924, vol. 83, pp. 96–98.*

A rehabilitation service has been established by the government with the purpose of returning citizens suffering from physical defects that interfere with their vocational opportunities to remunerative occupations. The handicap to industrial workers meeting with bodily injuries is usually involved and includes:

1. Lowered morale.
2. The need of complete reorientation.
3. A limited knowledge of industrial opportunities
4. Questions of compensation, medical and surgical attention.
5. The overcoming of public opinion.

Many workers suffer from incompetent medical and surgical attention. —E. S. C.

REHABILITATION OF THE DISABLED. *G. B. Arana. Abstr. as follows from Semana méd., July 31, 1924, vol. 2, p. 242, in Jour. Am. Med. Assn., Oct. 4, 1924, vol. 83, pp. 1112–1113.*

This is Bosch Arana's official report on his mission to study prostheses, vocational training for the disabled, and workmen's compensation in different countries. He delivered addresses on kineplastic amputations in Paris, Milan, Bologna, Rome, and Madrid. He outlines the legislation he advises in Argentina for prevention and care of disability. Among the measures he advises are the provision by the state, the insurance society, or others of a new prosthesis once in two years for the amputated, and the prohibition of begging.—K. R. D.

GIVING THE BLIND A CHANCE IN INDUSTRY. *J. A. Kratz. Nat. Safety News, June, 1924, vol. 9, pp. 39–40.*

The main difficulty in the rehabilitation of the blind in industry does not lie with the blind themselves but in the fact that other persons doubt the ability of the blind to do the work usually performed by sighted persons. In the state of Minnesota it has been shown not only that the blind can be taught to use complicated machinery but also that they can teach other blind men to perform the same work. Experiment has proved that ninety processes in the factories of three cities were feasible for blind persons. In some classes of work the blind were even more accurate than the sighted, although not so rapid; the lack of rapidity, however, is frequently made up in constant and conscientious attention to the work. An appeal is made

to employers to give the blind a chance.—B. L. G.

THE CARE OF THE TUBERCULOUS IN INDUSTRY. *H. J. Howk. Boston Med. and Surg. Jour., July 17, 1924, vol. 191, pp. 91–94.*

In November, 1913, the Metropolitan Life Insurance Company opened at Mt. McGregor, New York, its sanatorium for the care of the tuberculous employees of the Company. During ten years 1,590 tuberculous patients have been admitted and to these full and free treatment has been administered. There is no definite time limit for the treatment of any one case. It has been found that for two years after improvement patients are liable to relapse; consequently there have been second and third admissions of the same person. From the third year on the number of readmissions rapidly lessens.

In addition to the treatment received, every person has been thoroughly instructed in the prevention and treatment of tuberculosis, and the Company believes that through this method of education large numbers of policy holders will eventually be benefited.

Early tuberculosis is a strikingly recoverable disease, but there cannot be too much emphasis placed on the need for continuous persistent effort in the detection of this malady while curable.—B. L. G.

WORK FOR THE TUBERCULOUS DURING AND AFTER THE CURE. PART 2. *T. B. Kidner. Arch. Occup. Therapy, June, 1924, vol. 3, pp. 169–193.*

This is the second part of a paper which was read by the author at the International Congress against Tuberculosis held in Brussels in July, 1922. In the following summary, the author describes briefly the results of his experience and his viewpoint:

1. That it is not possible, in the present state of our knowledge of the subject, to provide lists of occupations suitable or unsuitable for the tuberculous.

2. That there is urgent need for a wide and thorough study of all the leading occupations, so that more help will be available in directing arrested cases to suitable employment. As an integral part of any such study, an adequate and continuous follow-up system of arrested cases placed in occupations should be maintained.

3. That it is a mistake to advise arrested cases in general to seek "light outdoor occupations." (*a*) In scarcely any occupations of that type are the wages paid sufficient for a tuberculous person. (*b*) The seasonal character of many outdoor occupations renders them unsuitable for the tuberculous. (*c*) Experience of many observers has shown that arrested cases maintain their condition better in occupations in which they worked previous to their illness.

4. That in cases where it is necessary to seek a new occupation work of a type allied to the old occupation should be sought.

5. That there will be a large number of persons in whom the disease has been arrested who will be unable to work under ordinary conditions of employment. Provision must be made for such persons in special workshops and industrial and agricultural settlements.

6. That trained vocational advisers should be employed to study, with the aid of the physician, each individual case; so that the person may be directed toward an occupation suitable not only to his physical powers and previous experience, but also to his mental ability, his temperament, and his social aptitudes.

7. That each occupation in which it is proposed to place arrested cases of tuberculosis should be studied very carefully and an analysis of its conditions made, so as to enable the advisers to discover opportunities of safe employment for arrested cases.

8. That all employers of industry should maintain careful records of the incidence of all forms of sickness in their establishments, with the dual purpose of reducing health hazards and providing information useful in the guidance of substandard persons to suitable employment.—H. B. E.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

DISABLING SICKNESS IN COTTON MILL COMMUNITIES OF SOUTH CAROLINA IN 1917. *D. Wiehl and E. Sydenstricker. U. S. Pub. Health Rep., June 13, 1924, vol. 39, pp. 1417–1443.*

In connection with a study of pellagra in twenty-four cotton mill villages, 55,067 observations regarding illness were made in a total population of approximately 22,000; 1,241 cases of disabling illness were recorded in the canvassing period, which lasted from April to December.

The annual average number of days of disabling sickness per person was 9.3, a definite wave occurring in late spring. There was the usual age curve of morbidity. The excess female disability rate, exclusive of confinements, occurred in the period May to August, the season of highest pellagra prevalence.

The inverse correlation between disabling sickness and family income suggested in a study made in 1916 was confirmed.

Chronic illness seemed to vary but slightly. Illnesses of short duration showed a definite peak in May and June. The severe illnesses of late spring occurred relatively more often in the 15 to 24 years age period. The peak of absenteeism occurred in February for both men and women. Absence from work due to illness was highest in the spring and early summer.

The authors state that they do not feel that the data warrant more than a very elementary presentation.—P. K. C.

DISABLING SICKNESS IN SOUTH CAROLINA MILL COMMUNITIES. *U. S. Pub. Health Rep., July 18, 1924, vol. 39, p. 1723.*

In connection with a study of pellagra during 1918 in the cotton mill village of In, South Carolina, the opportunity was afforded of keeping the population under continuous observation during nine months for the incidence of sickness. This was done as a first experiment in making observations of this kind, but the results are interesting in view of the unusual morbidity experience in 1918.

Three definite variations in the sickness rate were observed: (*a*) a high rate in the spring due to respira-

tory affections, including influenza; (*b*) a sickness "wave" during the late spring and early summer which seemed definitely related to pellagra; (*c*) the influenza epidemic in the autumn.

A sickness wave in the late spring and the early summer consisted chiefly of complaints stated as "indigestion," "dysentery," "headache," and a group of ill-defined complaints, including "neuralgia," "kidney trouble," "heart trouble," and the very vague although not infrequent complaint of "not feeling well." The group of ill-defined complaints showed a very definite wave, with a peak in June, and may have a definite relation to a pellagra wave which never reached an eruptive stage.

A consideration of the age incidence showed (*a*) that the illnesses occurring in the late spring and early summer had a distribution similar in important respects to the pellagra age curve; and (*b*) that the respiratory affections in the autumn had a distribution somewhat similar to the influenza morbidity age curve.

An inverse correlation between family income and the sickness rate is shown both for influenza and other respiratory diseases and for illnesses and complaints occurring in the period March to August.—B. L. G.

SICKNESS AMONG 21,000 AUTOMOBILE WORKERS. MORBIDITY EXPERIENCE OF THE FLINT AND PONTIAC (MICHIGAN) SICK BENEFIT ASSOCIATIONS IN 1921 AND 1922. *D. K. Brundage. U. S. Pub. Health Rep., April 18, 1924, vol. 39, pp. 791–803.*

1. The sickness claim experience of the Flint and Pontiac sick benefit associations is of interest from a public health point of view on account of the knowledge afforded of the relative frequency of different specific diseases and groups of diseases, and the days of disability per member and per sick person from such illnesses.

2. These rates of sickness have to be considered in the light of the several "artificial" contributing factors existing—*i.e.*, conditions imposed by the rules and regulations of the organization affecting the frequency of sickness claims and the recorded duration of incapacitation.

3. Seasonal tendencies in the incidence of certain specific diseases and groups of diseases are disclosed in the frequency rates by month of onset.

4. Except for lead poisoning, the sickness rates by plants do not indicate the existence of serious industrial diseases, although the relatively high frequency of certain diseases, such as diarrhea and diseases of the stomach in plant B (Pontiac), and of diseases of the nervous system in plant D (Pontiac), and of diseases of the digestive system (Nos. 111–127) in plant J (Flint), suggest the desirability of investigating the causes of these rates in the establishments mentioned.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

REPORT ON MINERS' "BEAT KNEE" "BEAT HAND," AND "BEAT ELBOW." *E. L. Collis and T. L. Llewellyn. Med. Res. Council, Special Rep. Series, No. 89, London, Oct., 1924, pp. 49.*

This is a report undertaken by the Medical Research Council at the request of the Mines Department of Great Britain. It is notable that the coal mining industry, although the general mortality of its workers is low, suffers more from occupational diseases which are subject to compensation than any other industry in the country. After excluding miners' nystagmus, the group of diseases discussed in this report accounts for nearly 90 per cent. of the remaining cases of industrial disease in the whole country. The annual incidence per thousand persons employed underground in all British mines is: beat knee, 1.19; beat hand, 0.87; beat elbow, 0.13. The report is based on personal investigation in several coal fields, returns from the Mines Department and large indemnity companies, and replies to a questionnaire issued

to all the certifying surgeons of the country.

The term "beat" is of long standing; a "beat" hand is one which, from being vesicated or blistered with hard work, has festered (definition 1849).

The incidence of the diseases in the various coal fields and the etiologic factors are discussed at length, and the correlation coefficients of case rates per thousand employed underground, with physical conditions, are given. It has been difficult to correlate the statistical information with the clinical as so many factors enter into consideration; no essential contradiction, however, was found.

An interesting description is given of the prevalence of beat knee in the Somersetshire coal field, where the seams are thin ($1\frac{1}{2}$ to $2\frac{1}{2}$ feet) and where the coal is conveyed from the coal face by "boy" haulage. The boy wears a loose waistbelt of soft hemp rope and drags the coal out on a kind of toboggan. Owing to the thinness of the seams he has to crawl on his hands and knees, and injury to the knee cap is common. The incidence in this district is very high.

Age, occupation, and the physical conditions of the work are all discussed. Clinically the conditions are due to an acute localized inflammation of the deep layer of the skin, subcutaneous tissues, or underlying bursa, which has arisen in the course of the workman's employment. In the hand the condition invariably proceeds to suppuration; in the knee and elbow suppuration follows when the skin is infected, but an acute bursitis may resolve under the influence of early treatment. The etiologic factors are trauma and infection. The trauma may result from constant pressure, repeated small blows, or a single, well-defined injury; the infection from an open wound, a minute, unnoticed abrasion, the passage through sodden epithelium of the cocci which are normally present in the skin, or, in the absence of any local lesion, from bacteria circulating in the blood or lymph stream. The signs of the conditions are those of an acute localized inflammation—heat, redness, swelling, pain, and loss of function.

There are two distinct varieties of beat knee, one in which the skin over the upper part of the shin bone is infected, and the second where the skin and bursa in front of the knee cap are involved. The first form is due to the attitude assumed by the collier at work in a thin seam. The collier sits on his heels and the pressure is thrown on the upper part of the shin bone, the knee cap itself being free. In the second form of the disease the condition is brought about by crawling along on the hands or knees or by kneeling on a piece of coal or stone. Particles of coal and dirt often fall into the trousers and are caught by the cord which the workman so often wears round the upper part of the leg with the object of keeping his thighs clean (sic). This cord traps the particles, and abrasions of the skin follow. The authors advise "the abolition of the order of the garter so that the order of the bath may come into its own." Preventive treatment of beat knee consists in the intelligent use of knee pads, several forms of which are described and shown in an illustration, and personal cleanliness.

The definition given of "beat hand" is: "Any acute localised inflammation

without breach of surface of the skin of the palm, thumb or fingers." A description of the anatomy of the hand is given and the great danger of the spread of infection to the fascial planes is pointed out. Acknowledgment is made to the valuable work of Kanavel in the United States. Illustrations are given of beat hand and the effects of inadequate or delayed treatment and the authors are insistent on the great importance of skilful treatment of this condition. "We have notes of several cases where complete loss of function of the hand was the end result, where men in the prime of life became unemployable, and where the economic loss to the employer and State has to be reckoned in hundreds of pounds." Early after-treatment by physiotherapy is advised.

Beat elbow is a much less common condition and here the history of injury plays a more important rôle. The periosteum over the olecranon process becomes separated and small fragments of bone may be found in the bursa. Radiographs are shown with these fragments clearly visible. The bone often becomes exposed after suppuration and delays the healing of the wound.

The authors have also considered the condition of noninfective tenosynovitis, a condition frequently found in miners but one which is etiologically quite distinct from the "beats." The condition results from the continual jarring of the forearm and wrist at work in hard coal or stone and is a noninfective inflammation of the synovial lining of the tendon sheaths of the wrist or the forearm. The site most often affected is the outer margin of the forearm in the extensor tendons of the thumb. With rest the condition clears up quickly.

Conclusions.—The diseases now reported on are important not merely on account of the cost to the mining industry in compensation but because of the amount of suffering and disability they originate. Although ranking below miners' nystagmus in prevalence, beat knee year after year has stood second and beat hand third in the long list of diseases included in the schedule entitling to compensation under the Workmen's Compensation Act, 1906. Beat elbow and synovitis of the wrist are of less magnitude, but even these in comparison with other compensation diseases, such as lead poisoning and anthrax, stand high for the average annual number of cases.

No indications have been found that either beat knee or beat hand has been diminishing in prevalence. Hence we conclude that no effective means, such as have been taken to reduce the prevalence of accidents in mines or of lead poisoning in factories, have been adopted for their prevention.

1. The underlying cause for each of the diseases is the same—repeated trauma. The way in which this occurs varies for each disease but is always directly connected with methods of work; thus, the knee is injured by constant work in thin seams, and the hand by getting hard coal or using picks with rough handles.

The first line of prevention, then, is to guard against repeated trauma, or to minimize the results so far as is practicable.

2. The determining cause of an acute condition is the ingress of infection to tissues of lowered resisting power. No suggestion has been made,

nor have we found reason to conclude, that the infecting agents differ in any way from the usual micro-organisms which cause inflammation and suppurative cellulitis under other circumstances. Nor has evidence been forthcoming that some collieries have more cases than others, owing to some infection which exists in the workings.

The exact method of ingress of infection varies from case to case. It may be by some minute puncture, or through sodden skin, or from an infected blood stream. The point to stress is that the infection is generally personal—that is, it is present in the skin or in the blood.

The second line of defense is, then, avoidance of infection by keeping the skin clean and the general health good.

3. Even when infection has occurred but is in the preliminary stages, an acute condition can often be prevented by recourse to early treatment, for example, by the application of tincture of iodine. When the preliminary stages are passed, surgical treatment is needed; this treatment is skilled, and should be carried out by those with experience. The condition of beat hand may be cited as one where lack of expert action may result in the functional loss of a hand for a skilled worker.

The third line of defense, then, lies in the proper equipment and use of first-aid stations in close touch with skilled surgical advice, which is particularly needed for cases of beat hand.

These lines of defense can be strengthened by:

1. (*a*) The abolition of garters or other constricting bands worn below the knee.

(*b*) The use in thin seams of suitable knee pads.

(*c*) Attention to the smoothness of pick handles.

2. Increased attention to cleanliness of the skin. In this connection we consider that as the erection of pit-head baths is extended, attention should first be paid to collieries where thin seams are worked.

3. Improvement of first-aid stations directly under medical supervision, together with a spread of knowledge concerning the importance of their use.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

CENTESIMAL LUMINOUS OPTOMETER. *E. Ricci. Abstr. as follows from Ann. di Ott. e Clin. Ocul., vol. 51, p. 965, in Am. Jour. Ophth., Nov., 1924, vol. 7, p. 888.*

The author's instrument is devised to measure accurately differences of visual acuity as small as 1/100. A projecting lantern is used and a lens of known focus. The size of the image of a test letter thrown on a screen may be made to vary by changing the distance between the apparatus and the screen. Constant illumination, intense enough to obviate its influence on visual acuity, was used, and a special device which kept the image in focus at any given distance. An "E" is used, the image of which on the screen, when the lantern is at the nearest point to the screen, corresponds to vision of 5/4.5. When the lantern is removed as far as possible from the screen, the same letter gives

vision of 5/15. Other larger letters are used in the same way, giving corresponding visual acuities less than 5/15. The slide on which the apparatus is moved is fitted with a scale recording the vision obtained for each series of letters in hundredths. The same apparatus may be used with colored letters for the detection of color blindness. Cases of malingering are easily detected by repeating the tests, which in malingerers invariably give different results.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

MENTAL CAUSES OF ACCIDENTS. *A. L. Jacoby. Indust. Doctor, Nov., 1924, vol. 2, pp. 175–178.*

Industry recognizes the fact that behind every machine or mechanical device there is a human operator. The "human element" or "personal" factor is thus certain to enter into every operation.

There are quantitative differences between minds and these may be determined by psychometric tests. All operators of machines, whether factory or vehicular, should have an adequate mental age.

Although the quantity of mind of an operator is a considerable factor in the production of accidents, of even greater importance is the individual mental attitude, whether the result of individual evaluations of oneself in reference to one's environment or whether the result of disease processes in the nervous system or elsewhere in the body. Unfortunately, there are no methods of measuring this qualitative class of mental conditions with the same precision with which the quantitative mental defects can be measured. Attitudes are variable, in general, with the early environment and instinctive development of the individual and with his home conditions. Sudden emotional shocks render workers greater risks.

The field of mental factors entering into accidents is one that offers opportunities for extensive and profitable scientific research.—B. L. G.

SAFETY FIRST IN INDUSTRY. *C. K. Atkinson. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 229–231.*

Physical fitness is held to be a means toward accident prevention; health should receive the same attention that is paid to protection against accidents. Careless work and insufficient work result from low vitality; they indicate lack of interest and an accident may follow. Bad ventilation, causing undue fatigue, is an important influence.—E. L. C.

KNIVES FOR WOODWORKING PLANERS. *Travelers Standard, Oct., 1924, vol. 12, pp. 207–211.*

Workers on planers are exposed to dangers of kick-back or splintering which are often increased by the use of unbalanced planer blades. Excessive vibration of cutter heads is caused by planer knives which are not properly balanced. Tool grinders are careful to see that knives correspond in length, thickness, and weight, but it is

also advisable to see that they are properly balanced. A special balancing machine has been devised by which one can both balance one knife against the other and at the same time determine if the center of balance in each blade is in the middle of the knife.

Recommendations are also given as to safe practices in fastening blades to the cutter head, in the use of exhaust hoods over planer heads, and in adequate protection of the feed rolls of planers.—B. L. G.

EXHIBITION OF SPECIAL PROTECTIVE GOGGLES. *M. Radcliffe. Am. Jour. Ophth., Nov., 1924, vol. 7, p. 869.*

A pair of corrective goggles in which the patient's correcting lenses were mounted in separate cells back of the unbreakable lenses of the goggles was exhibited. The correcting lenses were held in place by a small projection on the temporal side of the cells fitting into a slot in the goggle frames and fastened down by blinders. The lenses are marked R and L to insure the proper insertion. The frames are set rather low and angular to prevent foreign bodies from flying under them and nicking the lenses.

An examination of fifteen electric welders was made for vision fields and blind spots. The result was negative, although some of these men had been employed for years. All of them used variously colored protective glasses. Usually two colored glasses, such as red and blue, were combined with a clear white glass to catch the metallic splash, the latter glass being frequently renewed. Exposure for a short time to the unshielded iron arc had no bad results, but prolonged exposure usually resulted in the delayed effects of an ultraviolet burn.—B. L. G.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

AN INVESTIGATION INTO BREAKAGE PROBLEMS. II. *G. H. Miles and A. B. B. Eyre. Jour. Nat. Inst. Indust. Psychol., Oct., 1924, vol. 2, pp. 150–154.*

In this investigation a reduction of 44 per cent. was effected in the breakages of articles by the attendants at refreshment rooms by making a number of alterations in the material conditions under which the work was carried out. Among other alterations, a better apparatus for carrying breakable articles was designed, protecting rails were placed round certain tables, shelves were widened, specially adapted racks and baskets were introduced, and means were adopted for relieving congestion at crowded spots. These and other adverse material conditions, acting hundreds of times during the course of the day's work, produced cumulatively a considerable degree of mental fatigue, which in its turn induced breakages. This was suggested by the fact that, before the changes were introduced, the breakages occurring between 4 and 6 P.M. were only 15 per cent. less than those between 12 noon and 2 P.M. (the busiest period), while they were 53 per cent. less after the changes were introduced. Again,

by an alteration of method, the delay met with in the disposal of material, which occurred every ten minutes or so, was reduced from seventeen to three seconds, and the consequent reduction of physical fatigue, in conjunction with the mental relief afforded, greatly impressed the workers. The main conclusion arrived at was that the essence of good work is smooth work.—H. M. V.

WOMEN AND CHILDREN IN INDUSTRY

THE TREND OF CHILD LABOR IN NEW YORK STATE. SUPPLEMENTARY REPORT FOR 1923. *N. Y. State Dept. Labor, Special Bull. No. 132, Nov., 1924, pp. 8.*

The trend of child labor is analyzed by the number of employment certificates issued, the number of children attending school, and the number of child labor violations. Too much emphasis must not be placed on one year's fluctuation, but the trend of several years is valuable. During 1923 there has been an increase of 4,000 in New York City, and 7,000 in the rest of the state in the number of employment certificates issued permitting the employment of children of 14 and 15 years of age. The number of children taking out vacation employment certificates has increased in the rest of the state but not in New York City.

High school attendance is not compulsory. Therefore an increase in the number of children in high school signifies that children in growing numbers are continuing through higher grades. Such an increase was present in 1923.

During 1924 there were 585 cases found of child labor violations. This is an increase over 1923, but the number of children employed has not risen to the level of years previous to 1922.

There were during 1924 several amendments to the child labor law. Boys between 16 and 18 years were limited to nine hours a day, and fifty-four hours a week in factories. Mercantile establishments were brought under the same restrictions. Children under 16 are not to be employed in the basements of mercantile establishments or restaurants unless special permission is granted by the commissioner. Legislation was enacted deferring the required attendance of 17 year old children in continuation schools until September, 1927. Permission was granted employers to establish continuation schools provided they have the approval of the commissioner of education.—B. L. G.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

SOME FACTORS IN GOOD INDUSTRIAL LIGHTING. *D. R. Wilson. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 233–244.*

This article is an able summary of the principles of industrial illumination. For the most part artificial lighting is discussed, but a plea is

entered for using daylight to its utmost by having large windows reaching to the ceiling, which are kept clean, or adequate roof lights. The standards laid down by the Factory Lighting Committee in its reports are clearly stated. As the author dealt with this subject recently in his article in THIS JOURNAL (see 1923–1924, vol. 5, pp. 371–381), further comment is unnecessary.—E. L. C.

THE PRESENT STANDARD OF SHIP SANITATION. *W. Hanna. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 251–258.*

The accommodation provided for seamen continues for the most part to be thoroughly unsatisfactory. In Britain previous to the Merchant Shipping Act, 1906, little was done; even now only 120 cubic feet and 15 superficial feet per man must be provided to include messroom or washplace, while 72 cubic feet is the minimum for sleeping. Such space is prohibitive of adequate ventilation without causing drafts. Little wonder the occupation of seaman is unhealthful. Berthing has been in the uncomfortable fore part of the ship; lockers are in the living quarters; heating and lighting remain utterly bad; lavatory accommodation is antiquated and foul; hospital accommodation is entirely makeshift. At last improvements are being made by some shipping companies, and an impetus was given by the standard ships of the ministry of shipping. Owing to the incredible past, men do not appreciate at first the new accommodation and misuse washhouses and baths; the story of the factories is being repeated. This phase will soon pass. Plans for crew accommodation in new ships should be approved by a competent sanitarian.

TABLE 1.—RECORD OF 613 BRITISH VESSELS AND 155 VESSELS OF OTHER NATIONALITIES

	BRITISH VESSELS BUILT		FOREIGN VESSELS BUILT	
	1892–1902	1912–1923	1892–1902	1912–1923
	%	%	%	%
Hospitals provided.....	28	48	25	79
Messrooms separate from sleeping accommodation.....	10	45	12	55
Washhouses provided...	52	88	31	94
Baths or showers provided for the crew....	17	39	6	41
One or more rat-proof storerooms provided..	22	53	12	52

The figures shown in Table 1 are of great interest.—E. L. C.

HYGIENE OF THE TRAMP STEAMER. *J. Howard-Jones. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 259–264.*

The author has long been a protagonist of improved hygiene on ships. He considers present conditions a matter of grave concern and in urgent need of reform. While other countries, such as Norway, Sweden, Holland, America, and Australia, have revised their regulations, Britain still muddles along in the old way. "If the Board of Trade does not feel capable of tackling the question in a satisfactory manner, then why not transfer it to some other Government Department, or appoint an Inter-Departmental Committee to go into the matter thoroughly, and thus obtain the assistance of those who are anxious to make the Mercantile Marine Services fit for the best seafaring men of this country which has been the leading Maritime nation for centuries."—E. L. C.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

THE EMPLOYMENT PHYSICAL EXAMINATION AS CARRIED OUT AT THE LIBRARY BUREAU. *L. P. Jones. Indust. Doctor, Oct., 1924, vol. 2, pp. 158–160.*

The first requirement for new employees after they have filed an application is that they shall be examined physically by the factory physician. The idea of this examination is not to exclude men from work but rather to fit the men to the job that they can do best.

The scope of the examination includes the eyes, ears, teeth, glands, lungs, heart and blood pressure, spine, feet, skin, reflexes, deformities and scars, urine, hernia; a complete history of previous illness or accidents is also requested. In addition, all those who are to work as food handlers are required to have a Wassermann test, throat culture for diphtheria carrier, and Widal test. Whenever an employee is being treated by his family physician and applies to the medical department to confirm the diagnosis, it is customary to make a complete examination and to report the results to the attending physician.

A system of examination is of benefit to both employee and employer, and it soon meets with the co-operation and the approval of all concerned.—B. L. G.

INDUSTRIAL HEALTH. *F. L. McCarroll. Pub. Health Jour., Aug., 1924, vol. 15, pp. 352–359.*

In this paper Dr. McCarroll reviews work along industrial health lines which is being carried on at the Spanish River Pulp and Paper Company. There are three mills, one at Sault Ste. Marie, Ontario, one at Sturgeon Falls, and one at Espanola.

There is "The Mutual Interest Board" composed of equal representation from men and management whose business it is to consider mutual interests and to arrange and ratify working agreements. At the present time the Spanish River Pulp and Paper Company under the caption of medical service is offering to its employees the services of a contract physician, an industrial nursing service, and a community nurse. The community nurse is assigned to the town of Espanola which is a Company town, and her work covers a very large field, overlapping to some extent the industrial visiting. In this particular town the Company has sponsored dental, throat, and eye and ear clinics which have apparently served the community efficiently. At the present time the Company has under consideration the routine examination yearly of all its employees.

It is the experience of this Company that industrial health is an important economic consideration not only because it reduces lost time from illness and other causes of absenteeism, diminishes labor turnover, prevents accidents and generally safeguards the health of the workers; but also because it advances the spirit of goodwill, loyalty, and co-operation which are of essential and fundamental importance to the attainment of the fullest measure of success.—H. B. E.

MEDICAL SERVICE OF AMERICAN TRUST COMPANY, BOSTON, MASS.

Co-operating with the Harvard Mercantile Health Work, the American Trust Company of Boston has just completed one year of an experimental medical service for its officers and employees. The results obtained so far are declared by officials of the bank to be highly satisfactory, and the service is now considered a permanent department of the bank.

A physician keeps regular office hours and is available for consultation by all employees without charge. Except in emergencies, the doctor does not give treatment. Many of the officers and employees have formed the habit of taking an annual physical examination and every new employee is urged, but not required, to be examined after entering the employ of the Trust Company. The service is voluntary, not compulsory.

The doctor has conducted an educational campaign against colds with particular emphasis on preventing their spread. Officials of the bank realize that the service has been in operation too short a time to have had a very decided effect on absenteeism from illness, but it is believed that the standard of health has been raised as a result of the service and that it is a distinct benefit both to the employees and to the bank.

The American Trust Company is said to be the only Boston bank to have installed such a service.

PHILADELPHIA ESTABLISHES MEDICAL SERVICE IN INDUSTRY. *E. K. Funkhouser. Nation's Health, Nov., 1924, vol. 6, pp. 753–754.*

Free examinations at plants during working hours, advice, and follow-up work are the Philadelphia Health Council's means of combating defects and preventing disease in the smaller plants which have no medical service of their own. Reports are given to the individuals examined, and the employer receives a report which gives no names but grades the health of his employees in classes. A sanitary review of the plant is offered to the employer.—E. S. C.

ESTIMATION OF DISABILITY AFTER ACCIDENTS. *H. Kämmerer. München. med. Wchnschr., July 18, 1924, vol. 71, pp. 988-992.*

This is a careful review of possible results of trauma. The author says that in all traumatic cases three questions are of paramount importance: (1) severity of the injury; (2) continuity of symptoms; and (3) time of onset of symptoms. He then shows how trauma may (*a*) cause disease, (*b*) make apparent latent disease, and (*c*) aggravate existing condition. He considers various organs:

1. Heart—pericarditis, myocarditis, endocarditis.
2. Blood vessels—aneurysm, rupture of vessel.
3. Gastro-intestinal tract—gastric ulcer, appendicitis, cirrhosis of the liver.
4. Lung—pneumonia.
5. Kidney—nephrosis (degenerative disease).
6. Endocrine organs—diabetes, thyroid conditions.
7. Central nervous system—progressive paralysis, tabes dorsalis, multiple sclerosis, syringomyelia, traumatic psychosis.
8. Tumors in all organs mentioned.

—H. E. H.

THE RADIOLOGICAL VIEWPOINT. *D. S. Childs. Indust. Doctor, Sept., 1924, vol. 2, pp. 140–141.*

The viewpoint of the radiologist in the use of the X-ray in industrial medicine and surgery is important. The X-ray examination is a consultation, and the result should be furnished in writing to the medical or surgical attendant. Reports should correspond to the records kept by employers and insurance companies.

In fracture work there are three important radiographs. In the order of their importance these are given as: (1) when patient is to be discharged; (2) after reduction and dressings have been applied; (3) for diagnosis. The use of splints which are not radiopaque is recommended so that dressings need not be removed.

In dermatitis where the X-ray is to be used as a remedial agent, no skin irritant should be used during two weeks prior to the X-ray exposure.

The competent radiologist need only be given the information as to the pathology suspected and where it is, and he will produce adequate film to confirm or not to confirm the diagnosis.—B. L. G.

INDUSTRIAL NURSING

A NURSE IN A TOBACCO FACTORY. *L. E. Black. Pub. Health Nurse, Aug., 1924, vol. 16, pp. 398–400.*

Only sixty-eight cases of tuberculosis were cared for during a three-year period in a factory employing 1,600 white and 1,000 colored persons. Of the sixty-eight cases eight were colored workers, indicating at once the incompleteness of the findings, for the death rate from tuberculosis in Richmond was then two and one-half times as high for the colored as for the white. Negroes are superstitious about tuberculosis and in many cases they do not report for fear of losing their " 'surance."

The factor of dust in this plant was practically eliminated, as tobacco must be kept moist if it is to be handled. Ventilation, however, becomes a problem, because all windows must be kept tightly closed to avoid evaporation.

In introducing the nursing service in the factory, the foremen were asked to report all workers showing general lack of interest, listlessness, and lack of energy. Finally the workers themselves were prevailed on to consult the office if they felt ill. A routine was established to confirm cases of suspected tuberculosis. All persons who could be induced to go were sent to a sanatorium; others were advised to take a complete rest and were visited at their homes by the factory and city nurses. Close attention was given to home conditions. Hospital patients were financed in various ways—by the city, by the state, by churches, by friends, by the Associated Charities, and often by contributions donated by fellow employees. Patients at home were provided with sleeping porches, extra milk, and partial support for short periods of time. Aftercare was given due consideration; patients returned to the factory were given suitable work and additional

rest periods. Chest and sputum examinations were carried out as routine procedures.

As a result, of the 68 cases 25 were sent to sanatoria, 12 died, 30 returned to the factory, and 26 were lost sight of during the period of convalescence. —B. L. G.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

A Study of Hygienic Conditions in Steam Laundries and their Effect on the Health of the Workers. *N. Y. State Dept. Labor, Special Bull. No. 130, 1924, pp. 110.*

This bulletin has been prepared for general educational purposes supplemental to the Industrial Code Bulletin No. 27, which also will be found in this publication (p. 87).

There are about 150 steam laundries in Manhattan. Of these, 38 per cent. are wet wash laundries. Twenty-eight per cent. of the fifty-three steam laundries of the Bronx are wet wash. Classification of these laundries on the basis of equipment and working conditions revealed only ten in Class A, forty-one in Class B, and 157 in Class C. The following results are based on the findings in the different departments of the laundries.

In the washing department there is usually very improper lighting; neither natural nor artificial light is made use of, the rooms being quite dark. Here the floor is always wet, the ventilation is very poor, cleanliness is neglected, and there are many accidents. If there were adequate drainage, water-tight trucks, proper washing technic, correct exhaust ventilation, as well as proper sinks, this might all be prevented. Dry floors and safety guards would reduce accidents.

Ironing departments are suffering under all the above conditions except the wet floors. But here there are more industrial hazards; mangles and presses are not provided with proper guards, collar ironing machines are a source of burns, carbon monoxide is absorbed in injurious amounts from gas-heated machines, and starchers go without gloves. In this department atrophic conditions of the nose and throat, conjunctivitis, nocturia, dizziness, and headaches were found as a result of atmospheric conditions. Long hours of standing result in flat feet and varicose veins. Blood chlorides are slightly diminished because of increased sweating. Changes in pulse rate and temperature, though not high enough to be abnormal in individual cases, are regarded as significant.

In all departments excessive fatigue is prominent. This work is a sufficient strain on the cardiovascular system to be a menace to the general health of the worker. The necessity of great adaptation is a strain on the organism; this might easily be avoided by the establishment of proper working conditions. Work in a model laundry need not, *per se*, be injurious to health. —B. L. G.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

PSYCHOLOGY IN INDUSTRY. *Budapest Letter, Jour. Am. Med. Assn., Oct. 4, 1924, vol. 83, p. 1093.*

An address was given recently in Budapest on the psychology of industrial work. W. Moede, professor of psychology in Berlin, described methods to determine which type of work is best executed by a certain industrial worker. There are already such laboratories operating in Germany, and the results attained are very satisfactory, not only from a scientific, but also from a practical point of view. In the laboratory the capability of attention and the energy of the applicant, how soon he develops fatigue, are carefully studied. After all these qualities have been found out, the candidates are recruited for certain lines of work, each of which demands different abilities. In the textile trade, where accurate attention is required, only those workmen are suitable who can centralize their attention. To become a good electrician, great dexterity is required. If an applicant wants to become a telephone girl, first her powers of observation are examined, and afterward her reaction time to outward stimuli is tested. Moede said that those factories which employ workmen who have gone through the laboratory find that the work done by the selected man is much higher in quality; the workmen lose much less time because of disease, and accidents are less frequent.—K. R. D.

DEVELOPMENTS IN THE FIELD OF MENTAL TESTING. *H. H. Dolan. U. S. Pub. Health Rep., Oct. 3, 1924, vol. 39, pp. 2505–2522.*

In this paper there is an attempt to give a general review of the present status of mental and psychologic tests. The Binet-Simon test with its various revisions is discussed and its limitations are strongly stressed.

Brief mention is made of the history of the development of the Army Alpha and Beta tests and these are contrasted with the Binet-Simon test.

The value of group versus individual examinations is considered. Individual examinations are deemed more accurate and trustworthy.

The development of psychologic and mental tests since the war is discussed. Schools, colleges, universities, and industries have shown an increasing interest along this line. Considerable research has been going on in applying psychologic tests to individual needs.

Psychologic tests are classified into three main groups:

1. The test for general intelligence.
2. Trade tests.
3. Tests for special aptitudes.

These are illustrated with some detail. Besides discussing psychologic tests specially devised for intellectual capacities, some space is given to consideration of tests for temperamental and physical traits. These latter are of recent development and their reliability has not as yet been determined. The use of psychologic tests in vocational guidance is considered to be of greater value.

While critical of the reliability of

psychologic tests in general, their value under controlled conditions is not underestimated.—H. B. E.

VOCATIONAL SELECTION IN A CHOCOLATE FACTORY. *W. R. Foster. Jour. Nat. Inst. Indust. Psychol., Oct., 1924, vol. 2, pp. 159–163.*

A series of tests was applied to a group of thirty-three chocolate packers, so selected as to include good, average, and poor operators. The performance of each girl in the tests was then compared with independent estimates of her ability as a packer. The correlation coefficient for a series of six tests (after the exclusion of the memory test, which gave a low correlation) was 0.69 ± 0.06. The packers were also tested for general intelligence, but the correlations of intelligence tests with packing ability were low, as they ranged from 0.00 to 0.41. The intelligence tests, however, correlated well with most of the other tests, and gave an average coefficient of 0.52.—H. M. V.

THE INSANE AMONG RAILWAY EMPLOYEES. *Paris Letter, Jour. Am. Med. Assn., Oct. 18, 1924, vol. 83, p. 1256.*

Dr. Pactet presented recently before the Société médicopsychologique two patients with general paralysis, one of whom was a switchman and the other a conductor on a de luxe passenger train. On a previous occasion, Pactet had presented before the Société clinique de médecine mentale a number of railway employees who were holding responsible positions involving the safety of the public and continuing to perform their duties, although they had been partially incapacitated for some time. Pactet's communication has given rise to interesting discussions, during which other psychiatrists have reported similar facts. Dr. Henri Colin, chief physician of the St. Anne Asylum, stated that he had been commissioned by the court to examine a railway employee charged with having committed assault and battery on a station agent, preceding an attack of epilepsy.

Dr. Legrain holds the view that alcohol can be incriminated for a great many railway accidents. Recently, following an accident in which many persons were killed, the switchman who was to blame for it was sought and was found in a cabaret. The public does not seem to suspect the menace to which it is exposed, though the evidences of intemperance on the part of many railway employees may be seen on every hand. The main reason why there are not more accidents seems to be that ordinarily the engineers in charge of trains make the same run every day and are therefore thoroughly familiar with every block and turn. Their work becomes, to a great extent, automatic. But once the unusual occurs (changes in the time-card, encumbered tracks, extra trains, holiday schedules, delayed trains), the engineer is obliged to assume some initiative, to which he is not accustomed. It sometimes happens that suddenly, within the space of a few seconds, he is called on to take some decisive action in response to a signal. Under such circumstances, if he is under the influence of alcohol, his reaction time may be retarded. Moreover, among drinkers there are many unsuspected cases of chronic alcoholism; these persons may

never be seen intoxicated, but it is possible for a gradual decline in their sensory acuity and their intelligence to take place which only an accident reveals. Legrain calls particular attention to color blindness in chronic alcoholics, which many employers overlook and also many physicians. He expressed regret that France had not followed the example of the United States, where, according to information received here, for some time past the railway companies admit to their employ only persons who are known to be of abstemious habits.

Up to the present time, the medical services of the railway companies have confined their examinations mainly to the periodic testing of the organs of vision and hearing of certain classes of employees, but no attention has been paid to the periodic testing of the mental status of those in charge of services involving the safety of passengers. It has been proposed that the Société médicopsychologique draw up a report on this question of the psychiatric supervision of employees attached to the services of common carriers, and that such report be submitted to the minister of public works. In the meantime, Dr. Trénel suggests that those classes of railway employees who submit periodically to a regular examination with regard to their visual acuity might be tested on this occasion as to the pupillary reactions, for it is significant that early disturbances of these reactions reveal latent general paralysis, though there may be no appreciable disturbance of vision.—K. R. D.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

ACCIDENT AND OCCUPATIONAL DISEASE—DISEASES ATTRIBUTABLE TO ACCIDENT. *Jour. Am. Med. Assn., Aug. 16, 1924, vol. 83, p. 558.*

The Supreme Court of Illinois holds (Peru Plow & Wheel Co. *v.* Industrial Commission *et. al.* (Ill.), 142 N. E. R. 546) that where an employee was disabled by an inflammation of the lungs which was probably caused by his continued breathing of iron dust in his occupation, his disability was a disease of his occupation, and it was error to make an award under the Workmen's Compensation Act of the state as for an accidental injury. The court says that it is its view that the word "accident" is not a technical legal term. No legal definition has been given or can be given which is both exact and comprehensive as applied to all circumstances. Those things which happen without design are commonly called accidents—at least in the popular acceptation of the word. Any event unforeseen, not expected by the person to whom it happened, is included in the term. An occupational disease is a disease condition arising gradually from the character of the work in which the employee is engaged. It does not occur suddenly, but is a matter of slow development. An occupational disease is not an accident. An accident, as distinguished from an occupational disease, as the former is contemplated under the compensation law of Illinois, which does not cover occupational diseases, arises by some definite event, the date of which can be fixed with certainty, but which cannot be so

fixed in the case of occupational diseases. In this case there was not one circumstance, incident, or time that could be pointed to as the starting place of the employee's disability, and the court is forced to the conclusion that the disability did not arise out of an accidental injury.

But not every disease is occupational simply because the conditions that were the immediate cause of the injury obtained for a long period of time. Certain diseases are well recognized as being attributable to accident, such as those caused by the entering of a disease germ through breaking of the skin, as anthrax. Actinomycosis, a disease caused by handling wheat and barley, has been held to be an accidental injury; also, disability caused from inhaling poisonous fumes in attempting to put out a fire; paralysis, caused by exertion of a traveling salesman in running to catch a train while carrying heavy hand luggage; nephritis, caused by exposure of the employee after working in heat and steam; eczema, caused by exposure to fumes and splashes of carbon bisulphide; rheumatism and gangrene, following an injury caused by dropping a heavy weight on the foot. On the other hand, it has been held that illness caused to a seaman by general exposure to rough weather could not be held to be an injury by accident, and that the death of a stoker following a gradual collapse from exhaustion induced by work for several days in the tropical heat of the Red Sea was not death by accident.

The rule recognized in Illinois is that, in order that the disability be by reason of an accidental injury or the result of an accident, it must be traceable to a definite time and place of origin. There must be some definite thing happen which can be pointed to as the immediate cause of the breakdown, although the employee may have been able to work in similar conditions for a considerable period of time prior to the happening of the event which was the immediate cause of his breakdown.—K. R. D.

CHRONIC INSIDIOUS BONE AND JOINT DISEASE AS A CAUSE OF PROLONGED INDUSTRIAL COMPENSATION. *H. R. Conn. Indust. Doctor, Oct., 1924, vol. 2, pp. 151–156.*

Anything which threatens the harmonious relation of employer and employee is of vital interest. One of the most virulent causes of discontent and misunderstanding is the question of financial compensation to diseased employees who allege injury as the primary cause of their disabilities. The responsibility of chronic diseases should not be placed on factory management.

Hypertrophic arthritis is an injury which is frequently alleged and for which compensation is demanded. The attitudes of the Pennsylvania and New York commissions is that each case must be considered on its own merits, but that hypertrophic arthritis is never the result of an injury; also that unless the trauma is so severe as to produce fracture or a synovitis, the disease has not been aggravated by an injury.

The Ohio commission is of a different opinion, believing that there is no question but that this disease may be aggravated by injury. Two Ohio cases are cited. No. 103816 claimed total disability due to the assumption

that occupational strain aggravated his syphilis. No. 120612 claimed compensation for encephalitis lethargica, due to a bump on the head. In both cases compensation was awarded.

Chronic infectious arthritis is a disabling disease appearing usually after middle age, often as the delayed result of dissipations of earlier life. It may have its foci of infection far removed from the point of eruption and it usually continues for many years before it becomes serious enough to be disabling. When it finally does destroy joint motion, or produce interlocking bone spurs, then it is that a worker demands compensation from his employer. It is conceivable that violence could aggravate pain in such a disease but to award total disability is absurd. Bone tumors, on the other hand, are quite often the result of violence and when the tumor is a result of injury sustained at work, full award is made to the employee. (*Cf.* case No. 108776, Ohio.) The dividing line between frank disease and disease aggravated by injury is sharp. Industry should not be made to pay for the indiscretions of a worker's youth. Relief is offered by the adoption of limited liability clauses.—B. L. G.

SPECIAL REPORT. INDUSTRIAL COMPENSATION FOR OCULAR INJURIES. *W. M. Sweet. Am. Jour. Ophth., Nov., 1924, vol. 7, pp. 876–880.*

Interpretation of the language of the Pennsylvania Compensation Law as it refers to the permanent loss of the use of the eye has been the subject of considerable controversy. For a disability partial in character the law provides 60 per cent. of the difference between the wages of the injured employee at the time of the injury and the earning power of the employee thereafter, but excepts from this clause certain cases, one of which is the eye. What constitutes the loss of the use of an eye is the point on which the controversy rests.

Injuries to the eye may be divided into two classes—those in which injury has resulted in a permanent reduction of vision not improved by glasses, and reductions of vision which may be improved by glasses. A typical example of the first group is one which came before the Superior Court of Pennsylvania in October, 1922. The claimant had been injured during his work so that he then had lost 56 per cent. of the visual efficiency of one eye. He was paid compensation during the time he was unable to work, and when he had recovered he executed a final receipt stating that disability had ceased. In 1921 he appealed the case, stating that he had lost the use of his eye as the result of the previous injury. Finally, after the case had gone through several courts, he was not awarded compensation, the court deciding that the evidence did not show that he had lost the use of his eye.

There are several cases of the second type, most of them dealing with the loss of the crystalline lens. When one loses this lens he must, in order to bring an image on the retina of his eye, wear a thick glass before the eye; he cannot wear this glass and use his other eye at the same time for he will then have double vision. But in several such cases the courts have not awarded full compensation. An individual who has lost this lens has three advantages over one who has

lost his eyeball: He has no deformity; he has protective vision on the injured side; and in the event of the entire loss of the other eye he can, by use of a glass, have normal vision in the first eye. Moreover, in case full compensation were awarded for the loss of the crystalline lens and by aid of a glass the individual was using his eye with practically normal vision, if then the eye should be injured so as to destroy it completely, the sufferer would again claim full compensation for the loss of the same eye. In this manner one man might by four accidents be awarded full compensation four times for the loss of both eyes. This certainly could not have been the intent of the compensation law; therefore full award is not made for the loss of the crystalline lens, for the employee has not lost the use of the eye.—B. L. G.

REHABILITATION OF DISABLED EMPLOYEES

THREE YEARS OF REHABILITATION. *R. M. Little. Indust. Doctor, Sept., 1924, vol. 2, pp. 135–136.*

In the state of New York 1,454 workers have been rehabilitated since July 1, 1921, by the Bureau for the Rehabilitation of the Physically Handicapped. Of these workers, 174 were women. The average cost per capita was $175. These workers are now earning $1,454,000 in yearly wages instead of having $336,200 expended for their maintenance. Although the Bureau was a new venture, its worth to the state can be read in these figures.

The Bureau functions in co-operation with the state departments of health and labor, and these departments are required to report to it the physically handicapped who come to their attention.

The medical and surgical service received by the disabled is of first importance. All treatment must have two aims: (1) the cure of the individual; (2) such a cure that he is not handicapped for future occupation. If injured workers could receive the attention of the more competent physicians and surgeons, many more of the physically handicapped could be rehabilitated.

The effectiveness of rehabilitation is in direct ratio with the previous education of the individual.

Request by the Bureau is made to physicians, industrial managers, and employers, that they report the names and addresses of injured workers; also, that before purchasing artificial appliances, making lump settlements, etc., they consult the Bureau as it can be of great assistance in these matters.—B. L. G.

REHABILITATION FROM THE STANDPOINT OF INDUSTRY. *W. I. Hamilton. Arch. Occup. Therapy, Aug., 1924, vol. 3, pp. 277–283.*

The author in discussing the problem of getting disabled persons placed back in industry illustrates the difficulties encountered in doing so. There is (1) denial of responsibility and no interest; or there is (2) a well-meaning interest, but one that is based on misinformation; or there is (3) considerable willingness but no expert knowledge of how to take advantage of

all services available for the benefit of the disabled.

Co-ordination of our efforts and agencies is the most outstanding need for successful rehabilitation and placement. There is much to be done in this direction and, from the point of view of industry, there is considerable lack of co-ordination.

In our efforts to get our patients back to industry, we should capitalize the former experience, education, and training of the disabled worker. As industry is gradually assuming more responsibility in absorbing disabled workers, it is necessary that we use considerable care in our efforts to bring about replacements. Hamilton believes that when a patient leaves any kind of a curative institution, he should go back into an occupation in which the training and education and capability which he had before his injury or disease may be used. He believes that the aim of rehabilitation should be vocational.—H. B. E.

THE CONTRIBUTION OF PHYSIOTHERAPY TO WORKMEN'S COMPENSATION. *C. P. Hutchins. Indust. Doctor, Nov., 1924, vol. 2, pp. 167–172.*

Accident prevention through departmental or independent organization is being promulgated by careful and detailed inspection as well as by educational propaganda. Shrewd management in industry has come to recognize that cost production relating to human machinery is favorably affected by:

1. Measures to prevent accident.
2. First-aid facilities to prevent infection.
3. Intelligent surgery to conserve structure.
4. Rehabilitation methods to conserve function.

The last step is of particular concern in attempting restitution of the damaged part. Physiotherapy has attained some reputation in the curtailment of compensation costs. Numerous cases are cited, and the net saving in the instances of individuals helped or cured by the use of physiotherapy when other methods have failed is shown. Among the patients who were successfully treated were those suffering with paralysis, loss of vision, callus formation after delayed union, and nerve injury.

Out of seventy-seven cases on which a financial report was made in December, 1923, twenty-eight were reported unimproved; the other forty-nine, however, justified the investment and overhead expenses—B.L.G.

SOME SOCIAL AND ECONOMIC EFFECTS OF WORK ACCIDENTS TO WOMEN. A STUDY OF FIVE HUNDRED WOMEN COMPENSATED FOR PERMANENT PARTIAL INJURIES. *N. Y. State Dept. Labor, Special Bull. No. 127, Nov., 1924, pp. 67.*

From the point of view of rehabilitation, permanent partial injuries are the most important. This is a report of case studies of 500 women who suffered such disabilities.

Permanent partial disabilities were caused in two-thirds of the cases by power machines, and of these one-half were caused by the punch press. The greater portion of the injuries were minor in character, only 12.8 per cent. being major. In regard to industrial rehabilitation, 52.4 per cent. had succeeded in regaining their earning

capacity, but 21.2 per cent. have been eliminated from industry as the result of accident. The proportion of women making a satisfactory industrial adjustment fairly consistently increases with the decrease in the amount of compensation, indicating that the New York State schedule of award correctly estimates the relative seriousness of the injuries listed.

The occupation of the woman at the time of the accident is related to her final adjustment. The occupation determines on an average the seriousness of the injury; where the occupation was low paid and offered little chance for advancement, the women were largely forced out of industry.

Lack of schooling has proved a great handicap in rehabilitation. It is interesting that the oldest and the youngest workers are those who have made the poorest readjustment. A change in the work has always resulted in a loss in the earning capacity; workers who remained with their former employers have made the best individual readjustment.—B. L. G.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

CENTRAL NERVOUS SYSTEM

THE TRAUMATIC NEUROSIS. *M. B. Lennon. Jour. Am. Med. Assn., Sept. 6, 1924, vol. 83, pp. 738–739.*

In a group of forty-one industrial and nonindustrial accident patients presenting the symptoms of a post-traumatic neurosis, it was observed that trauma played a small part in their condition. When it is possible to obtain a complete, satisfactory history from such individuals, there is always found a man or a woman who has been decidedly neurotic. The patient and his psychic condition are not, however, the only problem, for if it were not for the sympathy of the neurotic man's wife, his family, and his doctor, as well as the well-meant advice of his friends, he would invariably recover from his injury without any severe neurotic condition. During his recovery, the patient, stimulated by sympathy, becomes obsessed with the desire to

collect damages; his state of mind and his injury become worse and worse until he has received compensation, after which he recovers in a remarkably short time.

How to help such patients is a pertinent question. Alert physicians and surgeons, aided by good welfare workers and with the co-operation of the wife, can usually prevent the development of a disabling neurosis. If this disability does develop, however, the opinion of the neurologists will be that the patient will recover as soon as compensation is granted, and that it should be granted at once. Unfortunately, it takes industrial commissions a long time to see the value of this procedure.

It is suggested that the term "compensation neurosis" be substituted for "traumatic neurosis," for it would stress the fact that compensation quickly terminates the period of idleness of the traumatized neurotic.—B. L. G.

RESPIRATORY SYSTEM

RESUSCITATION FROM CARBON MONOXID ASPHYXIA, FROM ETHER OR ALCOHOL INTOXICATION, AND FROM RESPIRATORY FAILURE DUE TO OTHER CAUSES; WITH SOME REMARKS ALSO ON THE USE OF OXYGEN IN PNEUMONIA, AND INHALATIONAL THERAPY IN GENERAL. *Y. Henderson. Jour. Am. Med. Assn., Sept. 6, 1924, vol. 83, pp. 758–763.*

A large proportion of all deaths is immediately due to failure of respiration. Various procedures and apparatus have demonstrated their ability to save some of these lives. The methods used lie in an entirely new field, which may be called inhalational therapy.

Manual Artificial Respiration.—The prone pressure method has proved the most valuable. Essentials of any artificial method of respiration are that it should be applied without the loss of a moment, even if the patient is at first pulseless and apparently dead; that it should be continued for three hours, or until spontaneous breathing returns, or rigor mortis develops.

Prevention of Respiratory Failure.—Carbon dioxide is the natural stimulant of the respiratory center, while oxygen deficiency acts as a sort of whip which will excite respiration even to excess activity, but pure oxygen alone is not a stimulant to respiration. In respiratory failure oxygen inhalation alone is, therefore, not a logical procedure. The last resuscitation commission has approved the use of the H-H Inhalator —a method of resuscitation which utilizes a mixture of 5 per cent. carbon dioxide and 90 to 95 per cent. oxygen.

Carbon Monoxide Asphyxia.—In many industries, in garages, and occasionally in homes, carbon monoxide is an important health hazard. When the inhalation treatment is applied to an asphyxiated person, the carbon dioxide excites full, deep breathing, thus causing oxygen to be drawn into the lungs in concentration great enough rapidly to displace carbon monoxide from the blood. When this therapy was first begun, the great fear was that it might overwork the heart. Experience has shown that there is no such risk. The most gratifying result has

been the prevention of postasphyxial pneumonia. Formerly, one-third of the persons severely gassed died later from pneumonia; at present not one of the patients treated by the inhalation method has died in this manner.

Elimination of Volatile Poisons.—Cases of acute alcoholic poisoning treated in this manner have been restored to consciousness, and there has been no subsequent nausea or vomiting. The principal method of excretion of methyl alcohol from the body is through the lungs. Here the stimulation of breathing by the inhalation method is almost a specific treatment. The inhalation of carbon dioxide after and before anesthesia, or as a treatment of morphine narcosis is especially recommended. The treatment after anesthesia increases the volume of breathing, prevents the occurrence of the usual partial asphyxia, and tends to decrease nausea, vomiting, and gas pains. It has also been used in cases of uncontrollable postoperative hiccup with beneficial results.

Oxygen Inhalation in Pneumonia.—Under the conditions of respiratory distress existing in pneumonia, carbon dioxide should not be administered, but oxygen alone has proved quite effective in the relief of such conditions. Hospitals are urged to provide inhalators especially designed for use with either a carbon dioxide-oxygen mixture or with oxygen alone. —B. L. G.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

SUMMARY OF PRESENT PRACTICE IN INDUSTRIAL POISONING PREVENTION: TENTATIVE REPORT BY INDUSTRIAL POISONS COMMITTEE, CHEMICAL SECTION, NATIONAL SAFETY COUNCIL. *N. Y. City Dept. Health, Month. Bull., Oct., 1924, vol. 14, pp. 225–234.*

SECOND PROGRESS REPORT OF THE SUB-COMMITTEE ON BENZOL OF THE COMMITTEE ON INDUSTRIAL POISONS, NATIONAL SAFETY COUNCIL, CHEMICAL SECTION. *Louisville Safety Congress, Sept. 29–Oct. 3, 1924, pp. 16.*

These investigations disclosed a series of fifteen deaths and eighty-three more or less serious illnesses occurring as a result of industrial benzol poisoning during the past few years. Of a group of eighty-four workers exposed more or less continuously to varying concentrations of benzol fumes, thirteen men, or 15 per cent., showed low white blood cell counts. Benzol concentrations ranging from 28 to 4,140 parts per million were found in places where one or more workers were exposed.

For determining benzol in air the authors describe their apparatus, consisting in activated charcoal tubes through which dried benzol-air mixtures are drawn at measured rates and the increase in weight of the tubes determined.

The committee concludes that adequate hoods and exhaust fans can satisfactorily contend with situations

met with in industries where benzol is used.—P. D.

HYDROGEN CYANIDE POISONING IN INDUSTRIAL PROCESSES AND THE DETECTION OF HYDROGEN CYANIDE IN THE AIR ABOVE ELECTROPLATING BATHS. *F. Koelsch and G. Seiffert. Abstr. as follows from Ztschr. f. Hyg. u. Infectionskrankh., 1924, vol. 101, pp. 190–196, in Chem. Abstr., Nov. 20, 1924, vol. 18, p. 3552.*

Under certain conditions, electroplating baths may give off sufficient quantities of hydrogen cyanide to be injurious to health. The safety limit for men who have had considerable experience in electroplating is about 0.1 mg. of hydrogen cyanide per liter of air. Pertusi and Gastaldi's reaction, *i.e.*, the production of a blue coloration on filter paper moistened with a solution containing benzidine and copper acetate in the presence of hydrogen cyanide, is suitable for detecting the gas in the air; the production of a deep coloration in less than one minute indicates that ventilation is necessary and that possibly too strong a current is passing through the bath.—P. D.

THE PRESENT STATUS OF METHYL ALCOHOL POISONING WITH SPECIAL REFERENCE TO ITS IMPORTANCE IN INDUSTRIES. *H. Brückner. Zentralbl. f. Gewerbehyg., Aug., 1924, N. S. vol. 1, pp. 17–20.*

Toxic Properties of Methyl Alcohol.—Methyl alcohol, like all alcohols, has a paralyzing effect on the central nervous system. In addition to that, it has the specific toxic action which is seen so often in connection with the methyl radical. For some reason, the organism has great difficulty in destroying methyl alcohol, so that it remains in the system from five to ten times longer than ethyl alcohol. Therefore the greater toxic action of methyl alcohol may be due to its continued presence in the body.

Diagnosis of Methyl Alcohol Poisoning.—The common symptoms of methyl alcohol poisoning are: a tired feeling, drawing pain in the legs, and cyanosis. The clinical picture is very variable, however, and includes dilatation of the pupils and changes in the eyegrounds which may be followed by atrophy of the optic nerve. There may be convulsions, collapse, and death.

Hygienic Significance of Methyl Alcohol in Industry.—The three important factors in methyl alcohol poisoning are: (1) the threshold at which its action becomes evident; (2) the concentration of methyl alcohol in the workroom; (3) the time in which the dose is taken. The lethal dose of 50 to 100 gm. must be taken in a comparatively short time. That is why no acute case of methyl alcohol poisoning has occurred in the industries.

The question of chronic poisoning, manifested by irritation of the mucous membranes, tiredness, dizziness, nausea, has never been put to the test in animal experimentation. These effects may, however, be avoided by (1) having large, well-ventilated workrooms; (2) keeping the methyl alcohol locked in large tanks and leading it off in sound plumbing tubes; and (3) pointing out to the workmen its dangers as a beverage.

The author concludes that methyl alcohol poisoning in the industries is not more important than poisoning from any other organic substances used as solvents.—H. E. H.

THE HEALTH HAZARDS OF WORKERS IN THE AROMATIC NITRO COMPOUNDS. *Grott. Zentralbl. f. Gewerbehyg., Aug., 1924, N. S. vol. 1, pp. 29–32.*

During the years of the war, 1914 to 1918, it was noticed that workers with nitro compounds were more liable to disease than other workers. This phenomenon was investigated by Grott and found to be true. He divides diseases into (1) skin, (2) respiratory, (3) digestive, and (4) blood and blood vessel. All these occur more often in nitro workers. In larger, better regulated firms, disease occurs less frequently among both the nitro workers and others; however, there, too, the nitro workers are more prone to disease.

Diseases of the blood and the blood vessels are more prevalent among females than among males; this is due to the greater susceptibility of females to disease. Skin diseases and digestive troubles occur more frequently among the males because they are usually placed in the more dangerous and dirtier part of the work.—H. E. H.

LEAD POISONING. *P. Schmidt. Zentralbl. f. Gewerbehyg., July, 1924, N. S. vol. 1, pp. 9–10; Aug., 1924, pp. 21–25.*

Fate of Ingested Lead.—The author considers lead poisoning from the standpoint of pathogenesis, injury, and symptoms. A common portal of entry is the stomach. The lead may be dissolved as lead chloride and may also form an albuminate. It is absorbed in a fine particulate form. In the intestine it may form salts with fatty acids or carbonates. It then passes through the mucous membrane and travels further either through the blood vessels or through the lymph. The blood goes to the liver which acts as a fine sieve; the endothelial cells, especially Kupffer's star-shaped cells, remove many particles. They are then excreted into the intestine in the bile. The portion that is not stopped by the liver, as well as the lead in the lymph, returns to the right side of the heart and thence to the lungs. The lungs are not so fine a filter as the liver but they remove a considerable quantity of the lead. This lead is gotten rid of by expectoration. The remainder is now free to enter the other vital organs, although it may still be removed by the gastro-intestinal tract, the kidney, and the skin.

Inhalation of Lead.—Lead may be inhaled as white lead dust or as the finest lead oxide dust. The greatest portion remains on the mucous membranes where it may be expectorated or swallowed, but some reaches the alveoli. This occurs more easily with finer dust and deeper breathing, especially mouth breathing. In the alveoli the particles are taken up by the endothelial cells and the phagocytes. It is unfortunate that the finest and most dangerous dusts thus get into the general circulation without being filtered out.

The Effects of Lead.—The lead impregnates the entire inner lining

of the arteries. It is also found in the capillaries. Hemorrhages are thus caused. When they take place in the gastro-intestinal tract they may give rise to hematoporphyrin. The intestinal tract is both the absorbing and the excretory organ for lead and its whole mucosa may be permeated by it. This may be the cause of the lead colic which is so frequent a symptom.

Lead attacks the hematopoietic red marrow of bone. Stippled and polychromatic red blood corpuscles are formed as well as basophils. The constant destruction of red blood cells leads to anemia. Lead may cause hemorrhages in the optic disk and also optic atrophy. It may cause lesions in the glomeruli of the kidneys, dysmenorrhea, abortion, and atrophy of the genital cells. It also attacks the central nervous system and the brain. In the central nervous system the most frequent result is a paralysis in the radial or the peroneal regions. Psychic changes also may be caused by lead.

The author believes that lead exerts its toxic action directly on the cell nuclei, causing a nuclear necrobiosis. The variability of symptoms is explained by the fact that lead wanders in the human body. It may be in a resistant place for some time and then be transported to a point of lesser resistance. The author doubts the value of diet in therapeusis. He suggests the possibility that substances might be ingested to form the more insoluble sulphide or sulphate. He does not believe that specific treatment including the use of iodine is of much avail.—H. E. H.

MERCURY POISONING FROM ELECTRIC FURNACES. *L. Jordan and W. P. Barrows. Jour. Indust. and Engin. Chem., Sept., 1924, vol. 16, pp. 898-901.*

Four cases of subacute or chronic mercurial poisoning were found among men operating high-frequency induction furnaces. One case terminated fatally; two of the other three cases were quite serious.

A survey of laboratory conditions during operation of the furnaces indicated the escape of mercury vapor from the mercury discharge gaps of the high-frequency converters. The concentration of mercury vapor in the air beside the furnace during operation was as high as 0.7 mg. per cubic meter, a concentration sufficient to cause mercury poisoning if daily exposure continued for several months or longer. Another source of possible poisoning existed in the frequent cleaning of the mercury and repairs necessary in the original type of discharge gap.

A new type of discharge gap having stationary electrodes, mercury-sealed discharge chambers, and operating in an atmosphere of hydrogen, was installed and enclosed in a separate compartment fitted with a forced-draft hood. Under these conditions the escape of mercury from the discharge gap could not be detected. Repairs to the gap are infrequent and the necessity of cleaning the mercury is practically eliminated in the present equipment.

The amount of mercury in the air of the laboratory was determined (*a*) by drawing the air through a glass tube packed with gold leaf and

determining the increase in weight, and (*b*) by bubbling the air through a Palmer apparatus containing aqua regia and analyzing for mercury by the reverse of the Nessler reaction for ammonia. That is, a solution containing ammonium chloride, potassium hydroxide, and potassium iodide was added to the solution containing mercuric chloride in unknown concentrations. The brown color produced was then matched against the color produced by known amounts of mercuric chloride. This procedure was found to be the more satisfactory of the two methods.—P. D.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

SYPHILITIC DISEASE OF JOINTS: A LATE MANIFESTATION. *H. Schlesinger. Abstr. as follows from Med. Klin., 1924, vol. 20, pp. 524–528, in Med. Science, Dec., 1924, vol. 11, p. 154.*

Late syphilitic disease of the joints is not uncommon. Diagnosis is made by the nature of the joints affected in some cases, by the simultaneous periostitis in the neighborhood of the joints, by positive Wassermann and by response to specific therapy. Fever is not always an important symptom, but pain is always present. Pain may be provoked on movement, by pressure, etc., or it may characteristically occur spontaneously, usually being worse at night. In the chronic forms the joint changes may lead to gross deformities and ankylosis. Diagnosis is aided by the presence of syphilitic lesions elsewhere. It is well to note that the Wassermann reactions of the blood and joint fluid do not always agree, the one may be positive while the other is negative, or even possibly both negative in a case in which the joint affection is syphilitic.—B. L. G.

SYPHILIS AND INDUSTRY. *P. E. Bowers. Venereal Disease Information, U. S. Pub. Health Ser., June 20, 1924, vol. 5, pp. 293–299.*

Dr. Bowers first indicates the relationship among tuberculosis, alcoholism, and lowered industrial efficiency. He shows how industry has become aware of these damaging factors and tries to prove that there exists an equally important relationship between syphilis and lowered industrial efficiency. After discussing the effects of syphilis in the first and second stages on the efficiency of the worker, which happen not to be serious, relatively speaking, he shows the damaging effect of syphilis in the third stage. After demonstrating the magnitude of this infection in the army and the successful methods of control initiated during the war, he gives the histories of a number of cases and points out their industrial implications.

The writer advises the requiring of a Wassermann test of the blood of all employees, and in addition a careful physical and neurologic examination. This would eliminate those suffering from active and latent

syphilis, and would encourage the taking of treatment. Moreover, the detection and elimination of syphilitic employees would prevent many of the medicolegal complications which come about through the operation of workmen's compensation laws.—H. B. E.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

"Listening In" Dermatitis. *F. W. Oelze. Dermat. Wchnschr., Aug. 30, 1924, p. 997.*

Three cases are mentioned of acute eczema, presumably due to "listening in" on the wireless. In one the eruption started within twenty-four hours of using the earpieces; in another, within a few days. In the second case the quality of the rubber in the earpiece was blamed. Two of the patients are reported to have been subject to skin troubles, and in two the rash extended much beyond the parts in immediate contact with the ear phones.—R. P. W.

Dermatitis from "Listening In." *H. Marcus. Wien. klin. Wchnschr., Oct. 9, 1924, vol. 37, p. 1069.*

The writer states that a case of dermatitis of both auricles has been previously reported caused by the frequent use of the telephone. Since then a large number have occurred, all in young persons, who frequent wireless concerts and have used ear phones. The affection, Marcus says, is induced by perspiration and other obvious noxae.—R. P. W.

Skin Inflammation Caused by Naphthalene Lubricating Oils. *E. Eisner. Zentralbl. f. Gewerbehyg., Aug., 1924, N.S. vol. 1, pp. 20–21.*

It was noticed that many of the female workers who had anything to do with the coal-tar lubricating oils would get a peculiar inflammatory condition of the skin. They would dip into the oil the nuts of screws, in preparation for being threaded, and thus they got the oil directly on their hands. A moist dermatitis might appear on the hands, forearms, neck, face, abdomen, and thighs.

When the oil was examined chemically, it proved to contain 1 to 1.5 per cent. of naphthalene. This caused the dermatitis.

Usually the milder cases are easily cured by the application of bland salves. Stubborn cases have been successfully treated by X-ray.—H. E. H.

On the Aetiology of Erysipeloid. *D. Acél. Deutsch. med. Wchnschr., July 18, 1924, vol. 50, p. 988.*

This paper gives the German literature relating to the question of the connection between the erysipelas of swine and erysipeloid. Out of six cases of the latter disease, Rahm cultivated the swine bacillus in two, Duttmann in six out of nine, and Diemer out of three found it in every case.

Dr. Acél examined five undoubted instances of erysipeloid. Four of the workers were "smoke dryers" and

"butchers'" assistants and the fifth was largely engaged in handling pork. Of the five he examined, the pure swine erysipelas bacillus was successfully isolated, tested, and cultivated in three. Acél says this bacillus is found in 50 per cent. of pigs.—R. P. W.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

PROTECTIVE DEVICES FOR PRINTING PRESSES. *F. Rothe. Zentralbl. f. Gewerbehyg., Aug., 1924, N.S. vol. 1, pp. 25–28.*

The author describes three types of machines: (1) machines with protective devices for the hands of printers; (2) machines that automatically are thrown out of gear in case of danger; and (3) machines in which the paper is put in the press and removed automatically.—H. E. H.

ACCIDENTS ON FOOT POWER MACHINES. *H. L. Reid. Indust. Hyg. Bull., Nov., 1924, vol. 1, p. 19.*

This short article pleads for the provision of guards for the point of contact on machines operated by foot power. A number of accidents are quoted to illustrate the danger from unguarded machines. In such accidents there is a tendency for the worker to push down on the foot treadle, increasing the severity of the accident.—H. B. E.

INDUSTRIAL SURGERY

BURNS AND SCALDS: THEIR TREATMENT IN CASES OF EMERGENCY. *G. R. C. Fisher. Manufacturers News, May 10, 1924, vol. 25, pp. 7, 23.*

The author of this article is in charge of instruction and lecture work for the Safety Department and Accident Prevention Bureau of the Illinois Manufacturers' Mutual Casualty Association. He points out the magnitude of the annual death rate from burns and scalds, and that mothers and little children under school age constitute 82 per cent. of the whole. He believes that burns and scalds frequently lead to death because of shock, and for this reason the treatment of shock should be an important part of the care of such accidents.

He mentions various methods and remedies among which may be mentioned the use of Carron oil, unguentine, castor oil, olive oil, etc. In the case of alkalies the use of weak acids is recommended; and in the case of acids the use of weak solutions of alkali is suggested.

The author emphasizes special methods when a child's, girl's or woman's clothes catch on fire, and this is that a wool blanket or any heavy garment should be used for protection and also as a means of extinguishing the flames. The victim must be thrown to the ground, turned on the unburned parts and the fire beaten out; she should then be removed from any draft of the open air or hallway into a room where the

windows and doors are closed. Burned clothing should be removed, care being taken to cut around parts which stick, and oil or lard should be rubbed in to loosen these parts. As the parts are uncovered they should be smothered liberally with dry flour or cornstarch. If the face is burned, a mask should be cut out and applied. The flour-smothered body should be covered with a warm blanket up to the chin and then aromatic spirits of ammonia in hot water administered to the victim.—H. B. E.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

ARTIFICIAL RESPIRATION IN ELECTRIC SHOCK AND GAS POISONING. *C. K. Drinker. Jour. Am. Med. Assn., Sept. 6, 1924, vol. 83, pp. 764–765.*

Many strange and ingenious sugtestions for resuscitation have been offered to the public. When we give all these methods a competent analysis, we are reduced to the prone pressure method of resuscitation as the great reliance for immediate emergency, and to the oxygen-carbon dioxide inhalation method devised by Henderson and Haggard as the physiologic antidote for carbon monoxide asphyxia. With this last method the patient, through simple inhalation, practically administers the gas mixture to himself. Physiologists may some day devise a positive pressure apparatus which, even in comparatively unskilled hands, can be relied on to ventilate the lungs. Examination of such devices as are now available has failed to disclose any that prove to be of value.—B. L. G.

WAGES AND HOURS OF LABOR IN FOUNDRIES AND MACHINE SHOPS, 1923. *U. S. Bur. Labor Statistics, Bull. 362, Sept., 1924, pp. 120.*

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

RESUSCITATION AFTER ELECTRICAL SHOCK. *W. Maclachlan. Jour. Am. Med. Assn., Sept. 6, 1924, vol. 83, pp. 756–758.*

In the study of electrical shock, certain points are evident. If the current flows from foot to foot practically no effect is noticed, but if the current passes through the thorax serious results will follow. If the parts of the body that are in contact with the conductors are dry, a less severe shock will be felt than if the contacts are wet. In low voltage shocks (220 volts), the effect is usually to cause fibrillation of the heart; with higher voltage (1,000 volts), the heart is not involved at first, but paresis of the respiratory center occurs.

Various methods of resuscitation have been advanced, but the prone pressure method has been most universally adopted. Its advantages lie in that it is always available and simple, that the exchange of air in the lungs is sufficient to maintain life, and that it is not only the easiest method to perform and the least fatiguing, but also that it can be performed by one person without assistance. Where men are trained in this method, and their efficiency maintained by practice, the lives of many fellow employees have been saved. A detailed description of the prone pressure method is included. —B. L. G.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

AUTOMATIC MEASUREMENT OF ATMOSPHERIC POLLUTION. *J. S. Owens. Abstr. as follows from Nature, vol. 114, pp. 330–332; Jour. Soc. Chem. Indust., Aug. 29, 1924, vol. 43, pp. 866–871, in Chem. Abstr., Nov. 10, 1924, vol. 18, p. 3442.*

The automatic recorder is primarily designed for measurement of *smoke pollution* in city air. A large circular disk of thick filter paper, divided into parts representing twenty-four hours, is caused to revolve by a clock, while at intervals a small disk $\frac{1}{8}$ inch in diameter is isolated near the edge of the filter paper by the pressure of a perforated plug, and through this disk 2 liters of air are automatically aspirated. Impurities are deposited on the paper; since in cities they are mainly due to smoke, these deposits approach blackness. Comparison with a standard lamp-black scale gives milligrams per cubic meter. A more complete description is given in the Third and Fourth Reports of the Great Britain Air Ministry Advisory Committee on Atmospheric Pollution. Many curves (milligrams per cubic meter *versus* hours) for London and vicinity show very clearly the large increase in air pollution between 8 A.M. and 10 A.M. every day except Sundays and holidays. The hours 2 A.M. to 4 A.M. usually showed less than 0.3 mg. per cubic meter, even for the smokiest districts; daytime sometimes showed above 2.0. Comparison with the Owens jet dust counter showed a reasonably constant relation. The maximum diameter of smoke particles of average haze is about 1.5 microns, of thick haze 3 microns. The application of the instrument to *factory dusts* is suggested, a special set of standards and suitably colored filter paper being used. The instrument, without modification, would show the contrast between day and night in a factory room; and between idle and working machines. Traces of acid or alkali mists could be detected by depth of color on paper treated with phenolphthalein or with litmus.—P. D.

UNDERGROUND CONDITIONS LIABLE TO AFFECT THE HEALTH OF WORKERS IN GOLD MINES ON THE

WITWATERSRAND. *H. Pirow. Jour. Chem. Met. and Min. Soc. of South Africa, Sept., 1924, vol. 25, pp. 54–96.*

The author is a mining engineer and he gives in detail his own observations made on working conditions in the gold mines. He advocates extended use of a direct vision konimeter by the use of which the amount of dust in the air can be immediately demonstrated to those present; he considers such demonstration of great educational value. Records indicate that the dust generated in different processes, while averaging about a mean for each process, varies so widely that conditions under which an operation is performed are more important than the nature of the operation. The only method of precipitating dust after it has gained access to the air is by condensation of water which carries down the dust particles with it. There are, however, practical difficulties associated with this method, and it has the disadvantage that it introduces a high degree of humidity in mine workings which are already hot. Ventilation must today be regarded as the chief means of combating the dust evil by sweeping the dust out from the workings. For this purpose a standard for the volume of air to be supplied higher than what is usually obtained is required; a standard suggested is 200 cubic feet of air per drilling machine, exclusive of the compressed air used by the machine. A number of observations are made dealing with the increase of temperature as the workings become deeper, and a rock temperature gradient is illustrated by chart.

The author advocates keeping live animals underground under varying conditions to act as a check on the mechanical tests used. He further considers that contributions to the compensation fund for silicosis should be apportioned according to the prevalence of conditions detrimentally affecting the health of underground workers; by this means a direct incentive to improve those conditions would be established.

The article is followed by an unusually complete list of references dealing with the subjects discussed. —E. L. C.

FIGURING LIGHT COST IN INCREASED PRODUCTION INSTEAD OF WATTS CONSUMED. *R. J. Waldo. Factory, June, 1924, vol. 32, pp. 816–818.*

This article is based on interviews with many executives. Most of them were willing to admit that good lighting is an important factor in improving and maintaining production. Good lighting results in less strain and reduces glare. Three instances are noted where the installation of good lighting brought about favorable changes in the home life of the worker. Ninety-five factory fires which started from cigarettes are mentioned. After these fires were studied, "87 proved to be cases where the cigarette smoking had been in a dark corner of the room; the finished cigarette had been thrown upon the floor and the fire started."

Numerous statistics are given, the most interesting of which are the following. "The highest accident figures are found in poorly lighted plants and in December and January." Less

than 40 per cent. of the factories of this country are adequately lighted. Other statistics are given which indicate the increased production following improvements in illumination of factories. Not only in production were improvements noted but in the health and attitudes of the workers. "Local" lighting in general was condemned and "general" lighting commended. Proper diffusion of artificial lighting, the use of reflectors, the proper location of lamps, and the use of sufficient wattage to insure sufficient intensity of light were the most important specific measures which were recommended because of the success with which these had been employed by the various executives.—H. B. E.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

PHYSIOTHERAPY IN INDUSTRY. *M. Swezey. Hosp. Management, July, 1924, vol. 18, p. 68.*

This short article gives a description of the department of physiotherapy connected with the Illinois Steel Company Hospital and the service it renders. It is equipped with various apparatus and has a treatment room with running water which provides for hydrotherapy. The original cost of the equipment was approximately $1,000. The operating expense including the salary of one trained technician is estimated at about $200 a month. This department treats only industrial accident cases; but this rather limited field offers a variety of cases where physiotherapy is indicated. The author of this article believes that there are definite physiologic benefits as well as desirable psychologic effects. —H. B. E.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

THE SHOE QUESTION—AND SOME ANSWERS. *R. B. Osgood. Nation's Health, Jan., 1925, vol. 7, pp. 22–23.*

The author believes that the main cause of foot discomfort is unhygienic shoes. The normal foot should be encased in a flexible shoe which protects it against the weather and the hard modern walking surfaces. The supporting shoe for abnormal feet should encourage their return to normal.—E. S. C.

COMPANY HOUSING IN THE COTTON TEXTILE INDUSTRY IN MASSACHUSETTS. *U. S. Month. Labor Rev., Aug., 1924, vol. 19, pp. 437–438.*

By means of a questionnaire the division of statistics of the Massachusetts Department of Labor and Industries has been able recently to publish some data relating to company housing owned or controlled by the cotton textile manufacturing companies of the state. Out of 187

companies it appears that 62 companies owned or controlled houses for occupancy by their employees. These houses were occupied by 21.9 per cent. of the total number of employed (not including their families). It also appears that the number of company houses varies inversely as the size of the place. The larger proportions are of frame construction and the rents are usually low. Most of these houses do not possess modern equipment. In some cases there are indications that community buildings other than houses were built for employees.—H. B. E.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

LABOR LAW OF JALISCO, MEXICO. *E. Y. Larson. U. S. Month. Labor Rev., June, 1924, vol. 18, pp. 1207–1222.*

LEGAL REGULATION OF THE EMPLOYMENT OF MINORS 16 YEARS OF AGE AND OVER. *E. A. Merritt. U. S. Dept. Labor, Children's Bur., Indust. Div., pp. 26.*

This pamphlet gives a summary of the regulations in effect in the various states, July 1, 1924, which deal with the legal regulation of the employment of minors 16 years of age and over. In general, these regulations relate to: (1) employment in occupations dangerous to life or limb or injurious to health or morals; (2) night work; (3) maximum hours of labor; (4) continuation-school attendance; and (5) double or triple compensation, under workmen's compensation laws, for minors injured while illegally employed.—H. B. E.

WORKMEN'S COMPENSATION ACTS AS RELATED TO SYPHILIS. *B. Bickel. Venereal Disease Information, U. S. Pub. Health Ser., Aug. 20, 1924, vol. 5, pp. 377–383.*

"Latent syphilitic infection plays an important part in workmen's compensation cases. The disease very often has led to large compensation expenditures by the employer. It frequently prolongs and delays the healing of wounds, the union of fractures, and often results in paralysis, insanity, blindness, or other disabilities."

Since the courts do not consider preexisting syphilis as a bar to receiving compensation, routine physical examination prior to employment and after injuries would be useful. It would be a gain to public health if antisyphilitic treatment were given to compensation cases where it is needed. By doing this, years of compensation liability might be avoided.—H. B. E.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

ANNUAL REPORT OF BRITISH MINES DEPARTMENT FOR THE YEAR 1923. *H. M. Stationery Office, 1924, pp. 195.*

This report, like its predecessors, contains a vast amount of information; indeed considerably over one-half of the volume is devoted to statistical tables and graphic records. Employment in coal mining was good, and a revival, as compared with 1922, is recorded in various forms of metalliferous mining. Particular attention is paid to the occurrence of accidents, the mortality from which rose in coal mines from 0.95 per thousand employed in 1922 to 1.06 in 1923, while remaining about stationary, at 0.70 per thousand, in metalliferous mines. Definite instruction to boys before they go underground is advocated and extension of the safety-first movement which at present is nearly confined to the Lancashire mines;

contravention of regulations cannot be prevented through government inspection; it must be taken in hand through pit discipline. One accident, due to a workman having an epileptic fit, gives food for thought; surely epileptics should not be permitted underground.

Little is said regarding the occurrence of ill health and disease; but the statistics tell of 1,000 fewer new cases of nystagmus, even though a similar increase in cases of beat knee took place and an increase in disabling accidents. Apparently the increased use of electric safety lamps, some of which are cap lamps, is exerting an influence.—E. L. C.

REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1923–1924. *H. M. Stationery Office, 1924, pp. 142.*

Medical research has now become so organized and active that it is difficult to recall how recent is this development. Yet in Great Britain the work had no existence before 1913, and in its present form is a postwar child; previously all that was done resulted from private, unaided effort. The present report reviews progress during the past five years as well as giving in detail investigations now in hand or just completed. While the problems awaiting solution are great and numerous, the methods and means of attack are admirable.

The sixth section of the report deals with industrial medicine and industrial fatigue; it refers to work done regarding dust inhalation and pulmonary disease; to research on miners' nystagmus; to an investigation of miners' "beat knee," "beat hand," and "beat elbow;" and to the occurrence of spirochetal jaundice among miners. A committee on industrial health statistics is investigating rural migration into industrial towns, the incidence of sickness among miners and quarrymen, the occupational incidence of cancer, and other cognate subjects. The physiology of muscular work is being carefully worked out, and also the physiologic costs of weight carrying, the results of rest pauses and changes of posture, and the influence of menstruation on efficiency. Psychologic investigations of industrial interest into monotonous processes, repetition work, and vocational guidance are in progress. The activities of the Industrial Fatigue Research Board, an integral part of the whole scheme of research, are summarized; they include field observations on optimum length of spell and rest pauses, accident causation, design of machinery, systems of ventilation, and weight carrying in the pottery industry.—E. L. C.

INDUSTRIAL HYGIENE AND THE MEDICAL PROFESSION. *J. G. Cunningham. Pub. Health Jour., Nov., 1924, vol. 15, pp. 508–510.*

It is estimated that at least half of the total sickness is preventable; still it is recognized that industrial workers lose four or five times as many days from sickness as from industrial accidents. Greater efforts have, of course, been made toward accident prevention than toward the prevention of sickness, for the effects of accidents are more challenging, the connection between cause and effect is more obvious;

accidents are, in the nature of things, more easily preventable, and also there is no difficulty in knowing whether the accident was caused by conditions in the plant or in the home. Means of sickness prevention can easily be found in bringing those who are already concerned with the prevention and care of sickness into closer touch with the industrial workers, in the prevention of employment of workers with disabilities at jobs which will intensify their disabilities, and in the prevention of employment of those with contagious diseases that might easily spread to other workers. An additional service that the medical profession could render industry is scientific research into the effects of industrial poisons on the human body with a view toward prevention.—B. L. G.

INDUSTRIAL HEALTH WORK. *H. L. Williams. Manufacturers News, Nov. 29, 1924, vol. 26, p. 13.*

Industrial health work is not merely a sentimental fad, but rather is sound business sense. Industries that have practised it longest are its greatest enthusiasts. Its values may not be cash dividends but those that accrue from it are of an equally valuable nature. Its immediate advantages may be found in increased production, increased efficiency, decreased operative costs, diminished unjust claims for compensation, improved home and community conditions, and improved understanding between employer and employees. The degree to which health work should be undertaken depends largely on the type of industry and its location; mining companies remote from social contact and medical assistance should provide care not only for the miners, but also for their wives and children. The chief advantage of industrial health work is the periodic physical examination: a man cannot be efficiently placed at work unless something is known of his physical condition. Investigations conducted by one life insurance company indicate that such routine examinations have a potential life-saving value of $30 for each employee. Industrial health has its opponents as well as its advocates, but an increasing number of industries are conducting health supervision to the satisfaction of the worker.—B. L. G.

HUMAN SERVICE IN INDUSTRY. *O. P. Geier. Nat. Safety News, Oct., 1924, vol. 10, pp. 43–44.*

Personal service in industry diligently exercised may in time aid, if not lead, the rest of society in social reconstruction. Hygienic standards of workmen in their homes may be raised by teaching them cleanliness in the workshop. Anything which is done in the plant to increase the health and comfort of the worker leads him to desire this comfort, and he unconsciously adopts similar methods in his own home. Of great importance is the care of the health of the worker. Lost time from preventable sickness is greater than lost time from accidents. The workman has not been taught to consult a reliable physician in the early stages of disease, and in the late stages when he does seek help it is usually too late. An all day dispensary and an all day clinic teach employees to

consult a physician when necessary and consequently loss of time from sickness diminishes and turnover costs decrease. "It is more important to teach men how to live than to teach them how to make a living." Industry has a great opportunity to teach just this.—B. L. G.

INDUSTRIAL HYGIENE IN PRUSSIA. *Berlin Letter, Jour. Am. Med. Assn., Dec. 27, 1924, vol. 83, p. 2109.*

In 1921, the Prussian ministry of state decided to appoint five *Gewerbeärzte,* or industrial physicians so called, as an aid to the technical industrial inspectors. For this purpose, Prussia was divided into four industrial medical districts: Düsseldorf, Arnsberg, Erfurt, and Breslau.

The activities of the industrial medical councilors, who began their work Jan. 1, 1922, include the following range of duties: (1) to assist with advice and by every means possible the officials charged with the general inspection of industry, including the mining industry, with reference to the problems of industrial hygiene; (2) a scientific inquiry into the morbific changes that occur in the organism of workmen under the influence of their industrial occupations, together with considerations as to their prevention and best means of treatment; and (3) the development of the general problems of hygiene in the various lines of industry.

The industrial medical councilors are expected to pay particular attention to the hygienic details of factory administration (dressing rooms, washrooms, bathrooms, toilets, cleaning and ventilation of workrooms, and the elimination of dust, fumes, and gases) and to the provision of first aid for the injured. Furthermore, they will collaborate in the appointment and supervision of the physicians entrusted with the examination of workmen employed in industries injurious to health and will see to it that proper quarters are provided for the severely injured. They may also assist in the solution of problems pertaining to the contamination of water, air, and soil and to complaints in regard to undue noise from industrial plants.

The industrial medical councilors will also aid in the collection of statistics on occupational diseases and mortality. In co-operation with the regular industrial inspectors, they will inquire into the processes of manufacture in general use and will study industrial diseases and poisonings occurring in industrial plants. Under certain circumstances, it may devolve on them to institute a systematic examination of certain branches of industry; if necessary, with the aid of experimental laboratory research. They may be called on to aid in the determination of the individual capacity and adaptation of workmen and general employees. The industrial medical councilors will keep in touch with the health insurance societies and the factory physicians; also with the administrative officers of the county and district. They will familiarize themselves with the problems of the employers' and the workmen's unions, and by lectures or informal talks will seek to awaken an interest in and a sympathy for the aims of industrial hygiene.

The industrial medical councilors will work hand in hand with the

industrial inspectors and the inspectors of mines. In all questions that arise they are the representatives of the administrations to which they are attached.

With the aid of the industrial medical councilors, the following problems have been investigated of late: the conditions of health among painters' apprentices who are using lead paints to a great extent; among workmen in quarries and stone workers, and among workmen in glass-making establishments, including those employed in the grinding of glass; preventive measures to avoid the dangers to health involved in the preparation of films in motion picture studios, where the lights used are causing eye injuries among those employed. A law has been drafted concerning the notification of industrial poisonings. An inquiry has been instituted into the enforcement of hygienic regulations in barber shops, especially those in factories and in garrisons. Experimental investigations have been carried on with regard to the problems of the industrial working day, especially with reference to the performance of workmen under various conditions. Excellent work has been done in preparing discussions of the problems on the programs of the third, fourth, and fifth sessions (1922, 1923, and 1924) of the International Labor Conference held in Geneva.—K. R. D.

PHYSIQUE IN RELATION TO NATIONAL EFFICIENCY. *W. Milligan. Jour. State Med., Nov., 1924, vol. 32, pp. 501–512.*

Some depreciation in the physical fitness of the nation's manhood seems to have taken place in the last thirty-five years; at any rate physical defects are more widespread than they should be. It is the duty of those in power to employ every means available to raise the standard of physical fitness of those whom a searching examination has proved to be below the A 1 standard. Soft flabby musculature very often goes hand in hand with sluggishness of the brain. For England and Wales alone the economic loss for industrial invalidity has been calculated to exceed £150,000,000 per annum. The fact that the death rate in the country has fallen very materially (in 1923 it was 10.3 per thousand) should not lull the national conscience into a state of serene security. It is true that the expectation of life has materially increased but not the period of man's full physical vigor. The most praiseworthy attempts have been made and are being made to stamp out various diseases. The ravages of the great white plague, tuberculosis, from which approximately 75,000 persons in Great Britain and Ireland die every year and some 750,000 are incapacitated, show a steady decline. There is no other disease, apart from cancer (which unfortunately is increasing), which exacts such a heavy toll on national efficiency as does tuberculosis.

The conclusions are reached that: (1) the physique of the nation is far short of what it ought to be; (2) the efficiency of the nation suffers correspondingly; (3) measures should be taken toward improvement.—D. A. C.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

INVESTIGATIONS ON THE OCCURRENCE OF IODINE IN NATURE. VI. THE RELATIONSHIP BETWEEN THE INCIDENCE OF GOITER AND THE IODINE CONTENTS OF THE SURROUNDINGS. *T. von Fellenberg. Biochem. Ztschr., 1924, vol. 152, pp. 141–152.*

From a comparison of the iodine content of the air, water, mineral matter, foodstuffs, etc., of the surroundings of villages in which the incidence of goiter is widely variable, it is concluded that the latter is highest in locations where iodine is deficient and *vice versa*.—J. P.

INVESTIGATIONS ON THE BIOCHEMISTRY OF THE FORMATION OF CANCERS. *R. Bierich and A. Rosenbohm. Biochem. Ztschr., 1924, vol. 152, pp. 193–202.*

This is a study of the chemical mechanisms of the spread of cancer induced in epithelial tissue by treatment with various tars (Hamburg, Amsterdam, vertical, and horizontal retort tars) into the underlying connective tissues. The general conclusions are that the cancer cells in the epithelium produce lactic acid from carbohydrates; the acid then diffuses into the connective tissue where it alters the protein of the collagen fibers by a process of partial hydrolysis and forms a gelatin-like substance which promotes the further growth of the cancer cells.—J. P.

MULE-SPINNERS' CANCER. *Brit. Med. Jour., Nov. 22, 1924, vol. 2, pp. 959–960.*

This leader reviews the position, pointing out that as recently as two years ago the existence of this occupational cancer was unknown; now it is as well known as chimney-sweeps' cancer which also affects the scrotum. The disease has been determined in the law courts to be connected with employment and to be compensable. Its discovery has led to further important investigations into the carcinogenic properties of mineral and other oils. Meanwhile adequate preventive measures must be adopted to guard the mule spinners.—E. L. C.

MULE-SPINNERS' CANCER AND MINERAL OILS. *A. Leitch. Brit. Med. Jour., Nov. 22, 1924, vol. 2, pp. 941–943.*

Figures are given establishing the fact that the small group of mule spinners in cotton mills accounts for over 20 per cent. of all cases of scrotal cancer in England and Wales. The absolute mortality among this group from this cause amounts to 0.5 per thousand per annum. No case of cancer of the penis occurred in this group. A review is given of other cases of cancer due to mineral oils to which these cases are attributed; and clinical evidence incriminating refined mineral oils is held to be weak. Animal (mice) experiments are quoted in support of the theory that the more volatile oils are devoid of tumor-producing powers, while the heavier commercial oils are carcinogenic. Oils from Borneo, Assam, Egypt, Burma, and Badar-

pur were found active. Heat, while at work, probably relaxes the tissues of the scrotum of mule spinners and allows the entry of oil into the large opened sebaceous follicles.—E. L. C.

NOTE ON CHIMNEY-SWEEPS' CANCER. *A. Leitch. Brit. Med. Jour., Nov. 22, 1924, vol. 2, pp. 943–944.*

The prevalence of scrotal cancer among chimney sweeps accounts for from 8 to 9 per cent. of all cases of scrotal cancer in England and Wales. Hence mule spinners (23,000) and chimney sweeps (5,251) account for nearly 30 per cent. of all cases. The mortality for chimney sweeps in 1921 to 1922 amounted for this cause to 1 in 1,140. Soot dissolved in sebaceous fat from a human dermoid produced malignant growths in mice. Probably the sebaceous secretion of the glands of the scrotum acts as a solvent of soot in the case of chimney sweeps.—E. L. C.

ARSENIC CANCER OF OCCUPATIONAL ORIGIN. *W. J. O'Donovan. Brit. Jour. Dermat. and Syph., Nov., 1924, pp. 477–481.*

The writer recalls the statement of J. A. Paris in the fourth edition of his "Pharmacology," 1820, that the arsenic fumes from the smelting of copper from the mines in Cornwall cause the horses and cows to lose their hoofs and that not infrequently these animals suffer from a cancerous growth on their rumps. Copper smelters occasionally develop this disease on the scrotum, similar to that which infests chimney sweepers. Leitch and Kennaway by applying 0.12 per cent. of arsenious acid daily to the epilated skin of a rat caused a wart. In 162 days this terminated in an ulcerated typical squamous-celled carcinoma.

The writer then proceeds to detail the clinical histories of three men who had been employed in the manufacture of "sheep dip." One, aged 44, had been exposed to the arsenical powder for twenty-six years; the second, aged 49, for twenty years; and the third, aged 35, also for twenty years. In each there was noticed a gradual darkening of the skin, but not of the mucous membranes. Some of the more exposed parts became quite swarthy in appearance and scattered freely over the trunk and limbs, in all, were noticed dark brown macules. Many of these surrounded small, palpable, horny elevations. Any of these may apparently increase and form large warts. In time, one or more of these ulcerates or develops malignant characteristics. The arsenical powder in which the men work is very dusty, so that it contaminates the whole surface of their bodies. Owing to this any part of the skin may become the seat of an epithelioma.

O'Donovan concludes that arsenical cancer has been known since 1820. Its medicinal production is established and accepted. It is provoked by the constant presence on the skin of certain kinds of arsenical dust; but many years of exposure are necessary. The type of growth is the squamous-celled carcinoma, which may be single or multiple. The tumors are painless, the neighboring glands are not affected in the early stage, therefore prompt excision is not followed by a recurrence.—R. P. W.

SOOT CARCINOMA. *H. Hauff. Abstr. as follows from Beitr. z. klin. Chir., 1924, vol. 132, p. 633, in Jour. Am. Med. Assn., Dec. 13, 1924, vol. 83, p. 1958.*

After a single prolonged exposure to the smoke of a fire which the man, aged 26, was fighting, there was no actual burn, but the side of the face where a sarcoma had been resected, two years before, developed carcinoma, recurring after repeated resection. Hauff thinks the case can be regarded as a soot cancer affecting a predisposed area.—K. R. D.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

USE OF CARBON-MONOXIDE GAS MASKS IN MINES. *S. H. Katz, G. S. McCaa, and A. L. Barth. Carnegie Inst. Technology, Bull. 14, pp. 76. Pittsburgh, Pa., 1924.*

This bulletin is the result of investigations conducted in a co-operative fellowship, under the joint direction of the Carnegie Institute of Technology, the United States Bureau of Mines, and the Advisory Board of Coal-Mine Operators and Engineers. During the ten-month period of the fellowship, the use of the gas masks in mining work was extended with satisfactory results, so that "by the autumn of 1924 nearly two thousand masks had been purchased by mining companies and thousands of extra canisters have been used."

The constructional details of the all-service mask developed by the Bureau of Mines (see THIS JOUR., 1923–1924, vol. 5, Abstr. Sec., p. 133) are described with curves, showing service time at 100 per cent. efficiency with 0.5 per cent. of carbon monoxide.

A large portion of the report is then devoted to accounts of fires and explosions in mines, with analyses of samples of the mine air. From a very large number of analyses, the authors conclude that in about 70 per cent. of the abnormal atmospheres likely to be encountered in mine air the gas mask is perfectly safe. At the same time, they believe that the flame safety lamp is equally essential, while the oxygen-breathing apparatus should be available in case the oxygen content is too low for safety. The gas mask is in no sense intended as a substitute for the oxygen-breathing apparatus, but can often displace it when sufficient oxygen is known to be present in the air, as shown by the safety lamp.—P. D.

ANILINE POISONING IN THE RUBBER INDUSTRY. *H. J. Cronin. Boston Med. and Surg. Jour., Oct. 9, 1924, vol. 191, p. 683.*

The use of aniline in the rubber industry has been practically discontinued. Its use is, however, occasionally revived; two cases that occurred during such a retrial are cited. The function of aniline in the rubber industry is to act as a rubber catalyzer, accelerating the vul-

canization process. Symptoms of poison from this substance are headache, dizziness, irritation of the mucous membranes, blueness of the face and mucous membranes, air hunger, palpitation of the heart, and extreme weakness. The blood picture is that of methemoglobinemia. Prevention of poisoning lies chiefly in substituting other less poisonous chemicals in its place. If aniline must be used it should be handled only by experienced workmen who know its dangers and will use it with caution. Mills should be hooded to draw off fumes, and rooms must be well ventilated. Rotation of employment is a necessity. The treatment of all cases consists in sending the patient out into the open air. Iron and tonics have been used. In chronic cases the treatment is similar, except that blood transfusion is sometimes done.—B. L. G.

TREATMENT OF ARSPHENAMIN DERMATITIS, MERCURIAL POISONING AND LEAD INTOXICATION. *C. C. Dennie and W. L. McBride. Jour. Am. Med. Assn., Dec. 27, 1924, vol. 83, pp. 2082–2084.*

This article reports the successful use of sodium thiosulphate in the treatment of poisoning by various salts of arsenic, mercury, lead, and bismuth. This method of treatment is based on the fact "that sodium thiosulphate will not only neutralize those metallic poisons which are free in the intestinal tract, but that it has the far more important action of rendering those substances soluble and excretable which have been taken up by the body and have been tightly bound by a protein radical." Several case reports are included in the paper. —K. R. D.

THE MENACE OF PHOSPHORUS FIREWORKS. *C. M. Salls. Indust. Hyg. Bull., Dec., 1924, vol. 1, pp. 21–22.*

Phosphorus poisoning is the most dreaded of the industrial diseases because of the great and prolonged suffering caused by the local disease and the shocking deformities which almost always result. Storage of the yellow phosphorus in many states has been regulated by law; red or amorphous phosphorus is not poisonous. In the manufacture of certain fireworks a red composition is used which contains some yellow phosphorus. The paper or sand coating and magnesium carbonate in the composition which are supposed to act as a preventive and antidote, respectively, are not effective, as seven deaths of little children who have put this composition in the mouth have been recorded. In the factory, employees must handle and inhale the fumes of yellow phosphorus; three cases of poisoning have been recorded from this source. The greatest hazard is undoubtedly the danger of ignition and poisoning in shipment or in storage. If the mixture is not prepared with extreme care the finished composition is very sensitive to friction. On account of the hazards recorded one of the largest fire works companies in the country has ceased to manufacture or handle this type of fireworks. It is recommended that rigid restrictions be placed on the manufacture and the storage of phosphorus fireworks.—B. L. G.

DUST HAZARDS AND THEIR EFFECTS

INVESTIGATION OF THE DUST CONTENT OF THE ATMOSPHERE. *H. H. Kimball and I. F. Hand. Abstr. as follows from Month. Weather Rev., 1924, vol. 52, pp. 133–139, in Chem. Abstr., Nov. 10, 1924, vol. 18, p. 3301.*

The Owens dust counter, an instrument especially designed for collection of atmospheric dust, is described. Observations are reported of the number and nature of atmospheric dust particles at the American University and at various altitudes in airplane flights. A close relation was found between dust content of the atmosphere and visibility. The dust content of the air in the city of Washington was markedly increased in the winter of 1922 to 1923 by the enforced use of bituminous coal in heating private dwellings. While mineral matter, loess, spores, diatoms, and pollen were identified, as well as transparent spherical particles of a glassy nature, probably from local furnaces, no dust that appeared to be of volcanic or cosmic origin was observed.—P. D.

CONSIDER THE RESPIRATOR. *E. H. Brown. Nat. Safety News, Oct., 1924, vol. 10, pp. 37, 40.*

It is common experience in the case of respirators that many are furnished but few are worn. The fact that respirators are of decided benefit in fighting dust hazards is well known among employers, but to put a respirator on an employee is a problem 75 per cent. of which is man and 25 per cent. respirator. Diseases due to occupation are gradual and the danger often seems remote to the healthy worker. The man is frequently indifferent if not hostile to the use of the respirator and the supervisor quite often follows the path of least resistance. When the attitude of the worker has been changed through the use of consistent efforts toward education, we may expect to find the development of the perfect respirator.

Description is given of a home-made respirator of muslin; also of one recommended by the New York Industrial Commission which was found by test to filter out all dust for a period of four hours or more.—B. L. G.

PNEUMOCONIOSIS. *E. A. Gray. Ill. Med. Jour., Sept., 1924, vol. 46, pp. 212–218.*

After definitions of the term pneumonokoniosis the author describes the various dusts, organic and inorganic, which produce this condition. These dusts need not be inhaled to produce pneumonokoniosis and its subdivisions; ingestion serves the purpose equally well. As dust is deposited in the alveolar spaces, lung capacity is reduced, the lung finally becoming so filled that only a small part is left for aeration. This part usually is put out of action by a brief pneumonia.

In the study of such disease, occupation should be included in the history. The principal points in physical diagnosis are noted; the treatment is specified as consisting in rest. Prognosis is bad, for lung tissue once lost is gone forever. It is recom-

mended that physicians in manufacturing districts know something of the process of manufacture, so that they may more easily recognize workers whose jobs present this hazard.—B. L. G.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

ANTHRAX IN VARIOUS COUNTRIES. *Internat. Labour Rev., Dec., 1924, vol. 10, pp. 1029–1034.*

Argentine Republic.—Among both animals and human beings deaths from anthrax have been decreasing. Among animals 10,140 deaths occurred in 1918, of which 6,815 were cattle and 2,947 sheep; in 1922 only 884 deaths occurred, 767 were cattle and 85 sheep. Among human beings 511 cases occurred in 1918, and 212 in 1921; but these figures are approximate.

Australia.—The disease is rare in the Commonwealth; thus in the state of Victoria, only 138 deaths occurred among cattle from 1914 to Aug. 31, 1923, and only 8 deaths among human beings in twelve years, 1911 to 1922. During the same twelve years 46 deaths occurred in all the states of the Commonwealth. The sources of infection have generally been skins and shaving brushes; only one case (not fatal) has been traced to wool. —E. L. C.

SPIROCHAETOSIS ICTEROHAEMORRHAGICA. THE PRESENCE OF THE CAUSAL ORGANISM IN SLIME AS A SOURCE OF AN OUTBREAK IN EAST LOTHIAN. *G. Buchanan. Brit. Med. Jour., Nov. 29, 1924, vol. 2, pp. 990–993.*

This article deals further with research undertaken to ascertain the cause of an epidemic of fatal jaundice which occurred among coal miners in East Lothian, Scotland. The leptospira of Weil's disease has been isolated as the cause and found among rats in the district. Now a natural habitat has been found in an infected coal mine; it consisted of roof slime formed by organisms with a glutinous envelope. Guinea-pigs inoculated with the slime developed fatal spirochetal jaundice. The leptospira was found in the slime. The affected miners worked in the particular section of the mine where the slime was found.—E. L. C.

CAUSATIVE RELATIONSHIPS OF INDUSTRY TO TUBERCULOSIS. *I. Galdston. Nation's Health, Oct., 1924, vol. 6, pp. 687–689.*

There is very good evidence indicating that tuberculosis spreads *pari passu* with civilization and particularly with industrialism. Participation in the industrial existence of today imposes an uncommon hardship on the individual in that the demands of the human organism must be subservient to the demands of the technology of the industry. The higher tuberculosis mortality rates for men than for women are undoubtedly due to the fact that more men than women are engaged in industrial work. In regions where

the proportion of the two sexes in industry is reversed, and again during the war when women enlisted in industry to take the place of men, we find a significant increase in the tuberculosis mortality of women. While the treatment of early and moderately advanced cases has met with eminent success, the achievements resulting from treatment are undone in most instances on the return of the affected individual to industrial life. Our knowledge of industries as related to health and of the part which industries play in determining the health status of the individual is relatively limited. Immediate results could be obtained if every practitioner included in the history the elements that deal with the industrial life of the individual. Much could be done to prevent tuberculosis if the physician would take care to evaluate the work of the pretuberculous individual in such a manner that his physical capacity and demanded performance are commensurable.—L. A. S.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Bread-Bakers' Itch. *R. P. White. Jour. State Med., Dec., 1924, vol. 32, pp. 556–563.*

In this paper Dr. Prosser White describes some interesting experiments he made on himself and his assistants, and urges that a common fund be inaugurated to support those engaged in food preparation, when suffering from a cutaneous eruption.

The identity of bakers' itch is not yet established, and its causation is far from settled.

"In our experimental trials each sample was placed on four plies of lint, under jaconet. The material was then applied against the naked skin, and the whole dressing kept in position with an arm bandage wound round in a figure of eight. In this manner, with a few exceptions, every application was allowed to remain for three days. Each agent or combination was tested on three different occasions, on three different persons."

Dry white flour has no action on the normal skin, except perhaps a soothing effect. A dough of pure flour and water, if kept wet for a long enough time under an impervious covering, will act as a poultice. In all our trials we found it quite unirritating.

Of all the combinations tested, low grade English milled flour, containing more or less finely ground bran (practically a war bread) caused the most keen irritation on the arms of the experimenters. Next in order of severity came the confectioner's "self-raising flour." It consists of $7\frac{1}{2}$ pounds of acid calcium phosphate and $3\frac{1}{2}$ pounds of bicarbonate of soda to 280 pounds of flour. Cream of tartar (a household baking powder), mixed with the flour in the place of the acid calcium phosphate, causes trouble but to a less extent. These tests were continuous for seventy-two hours.

A longer experiment is described as follows, consisting of "two preparations: one containing salox (ammonium persulphate and ammonium sulphate), fine flour, salt and water

in the usual proportions; in the second I substituted acid calcium phosphate for the salox. The wetted doughs made from these two formulae were applied on lint, one to each arm of my orderly and myself under jaconet. My orderly carried out this routine for two hours daily, including Sunday, for eight consecutive weeks. I carried out a precisely similar proceeding with these materials, always using the same preparation to the same part of each arm. The dough was kept *in situ* for not less than six hours daily, over a period of 56 consecutive days. Neither of us experienced the least irritation or discomfort, nor did our skins become red."

In no case of bakers' itch has the prevailing lesion been urticarious, erythematous, or exudative, but always eczematous. For these reasons I think we may exclude anaphylaxis or sensitization as a usual, ordinary, or common predisposing element in this complaint.

"Inquiry into the figures given by Skin Hospitals and the Dermatological Departments of General Hospitals, shows that about 300,000 new skin cases occur annually throughout the country. This means that, in round numbers, at least one in every 150 persons develops some kind of cutaneous trouble in the course of the year. Of this large number of skin complaints 75,000 will be cases of eczema or dermatitis. Amongst these will be classed those directly due to the occupation, and known under the name of 'Industrial Dermatoses.' They have been computed to number certainly not less than 18,755."—D. A. C.

ASPARAGUS DERMATITIS. *S. Schoenhof. Dermat. Wchnschr., Oct. 18, 1924, p. 1221.*

A housekeeper in an hotel, during the season, was in the habit of handling, cleaning, and cutting, daily, 20 to 30 pounds of asparagus. For twenty years she did this with impunity. Then suddenly she broke out with an intense vesicular, irritable eruption which lasted a fortnight. It was confined to the unclothed surfaces, such as the face, neck, and arms. The left hand, on which she lays the plant, is affected on the flexor surface only. On the right hand, in which she holds the knife, both sides are involved. The rash extends up to the axilla on the left of the elbow on the right arm. The rash has appeared during each of the last two years.

Schoenhof experimentally found that the asparagus juice applied to any unaffected part of the skin in the space of twenty hours brought out an intensely irritable, edematous patch covered with nodules and vesicles.—R. P. W.

DERMATOSIS FROM THE BITES OF THE PEDICULOIDES VENTRICOSUS IN GRAIN LOADERS. *Hudelo and Dumet. Bull. Soc. franç. de dermat. et syph., Nov., 1924, pp. 405–407.*

Very shortly after beginning to unload sacks of peas from Morocco, the men complained of violent itching of the uncovered skin. This was early followed by the appearance of papules. Each was centered by either a vesicle, pustule, or drop of or dried crust of blood. The face was apparently rarely affected, but any other skin surface may suffer later.

The infection was never carried to the men's families, although no precautions were taken. Professor Larousse isolated the "pediculoides ventricosus" and also a beetle, the "brachus." The former exists as a parasite on the larva of the latter. When this coleoptera changes into the adult form, the Acarus deserts and attacks man (Brucker and Seurat). This is the first epidemic noted in Paris. Others are mentioned in the north of Africa and ports of France. —R. P. W.

MINERS' NYSTAGMUS. DISCUSSION AT THE ROYAL SOCIETY OF MEDICINE. *Lancet, Nov. 29, 1924, vol. 2, pp. 1120–1121.*

The thought was put forward by Dr. F. Fergus who opened the discussion that miners' nystagmus might be due to a definite and specific micro-organism; the existence of constitutional and mental symptoms associated with oscillation of the eyeballs is held to support this suggestion. Dr. F. Robson followed with his own theory that inhalation of mine gases, particularly carbon monoxide, was the causative factor. Mr. G. H. Pooley distinguished between true nystagmus with oscillation and psychopathic symptoms associated with compensation; he attributed the disease to deficient illumination. Mr. B. Cridland supported the theory of inhalation of gases. Dr. J. W. Thomas favored the deficient illumination hypothesis.—E. L. C.

TREATMENT OF LIME BURN OF THE EYE. *O. Barkan and H. Barkan. Jour. Am. Med. Assn., Nov. 15, 1924, vol. 83, pp. 1567–1569.*

The treatment of lime burn of the eye should, in the opinion of the authors, consist in immediate rinsing out, lids apart, with a stream of cold water at the site of the injury; and the patient should then be dispatched post haste to a specialist. After removing every particle of lime still present, the specialist should use, according to the individual indications, the method of treatment outlined in this article. This consists in immersing the injured eye, thoroughly cocainized, in a 4 per cent. solution of neutral ammonium tartrate from one-quarter to one-half hour twice daily, and, within a few days, increasing to 10 or 20 per cent. according to the sensibility of the patient. Further handling of difficult cases is discussed. The authors report that incrustations following lime burns can still be cleared months and possibly years after the date of the injury.—K. R. D.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

ARTIFICIAL RESPIRATION SAVES LIVES. *Nation's Health, Nov., 1924, vol. 6, pp. 785–786.*

This is a review of "A Manual of Artificial Respiration by Capt. G. R. C. Fisher, formerly with the British Army Medical Corps and recently employed in the safety departments of industrial plants. Death is often only apparent in accidents due to electric shock, gas fumes, a blow, or a fall, and immediate artificial respira-

tion can save many lives. Captain Fisher prefers the Schäfer, or prone pressure, method of resuscitation.—E. S. C.

ACCIDENT EXPERIENCE OF THE IRON AND STEEL INDUSTRY. *L. W. Chaney. U. S. Month. Labor Rev., Nov., 1924, vol. 19, pp. 1139–1145.*

This report continues and brings up to the year 1923 the accident statistics for the iron and steel industry published in Bulletin No. 339 of the United States Bureau of Labor Statistics.—B. L. G.

THERE'S A REASON FOR SAFETY AT THE POSTUM PLANT. *C. T. Fish. Nat. Safety News, Oct., 1924, vol. 10, pp. 17–19.*

By reason of adequate lighting, of a well-guarded factory efficiently equipped, and with the co-ordination of engineering and safety committees, the lost-time accidents and compensation costs of the Postum Cereal Company have decreased one-half since 1919. All machinery is intensively guarded and the automatic nature of all operations has practically eliminated machine accidents to operators. Oilers and millwrights are the only employees who find it necessary to get in behind the guards, and they are equipped by training and experience to do the work safely. The safety committee consists of seven men and seven girls, representing all departments; the foreman of millwrights and carpenters is the chairman. This committee meets once a month and reviews all suggestions received. In addition three general meetings are held each month, one for foremen, one for assistant foremen, and one for representative workmen. Here accident prevention is emphasized by lectures and demonstrations. These meetings are held on company time, for accident prevention is considered as company business.—B. L. G.

TWENTY YEARS WITHOUT A "FATAL." *A. J. Lynch. Nat. Safety News, Oct., 1924, vol. 10, pp. 51–52.*

The Truscon Steel Plant at Youngstown, Ohio, has operated for twenty years, employing a force of 5,000, without a fatal accident. The accident frequency rate is at present lower than it has ever been before. This safety record has not been an "accident," but rather the result of intensive study of safe practices in industry and also the desire of the officials to protect their great family of employees.—B. L. G.

PHYSICAL AND MENTAL SAFEGUARDS IN A CANE SUGAR REFINERY. *W. B. Tyler. Nat. Safety News, Dec., 1924, vol. 10, pp. 19–20.*

In the plant of the California and Hawaiian Sugar Refining Corporation 1,500 workers are employed. All dangerous and moving parts of the machinery are guarded before the machine is put into use. All new employees are instructed in safety before going on the job and afterward. Three safety committees meet each month—a Workman's Safety Committee, a Foremen's Committee, and a Central Safety Committee. The last committee determines the practicability of and passes on all recommendations, familiarizes itself with the causes of accidents,

and fosters the instruction of all new employees as to the hazards of the work.—B. L. G.

MENTAL SAFEGUARDS FOR THE TEXTILE WORKER. *H. Saul. Nat. Safety News, Oct., 1924, vol. 10, pp. 46, 53.*

"Notice to persons seeking employment: Unless you are willing to be careful to avoid injury to yourself and fellow workmen, do not ask for employment. We do not want careless men in our employ." This notice greets all applicants for work at the United States Finishing Company, and to make sure that it is understood the applicant is asked if he fully appreciates the requirement. In parallel mills employing the same number of persons and both adequately safeguarded there is often found a great difference in the number of accidents, and the difference is due to the attitude of the workers. Thoughtlessness is one of the greatest hazards and it should be guarded against just as carefully as an exposed gear.—B. L. G.

GREATER SAFETY WITH KNIFE GUARDS. *W. F. McClellan. Nat. Safety News, Oct., 1924, vol. 10, pp. 55–56.*

The knife question is the greatest safety problem of the packing industry. Men who have been employed in factories where guards are not used are difficult subjects to teach the need of a knife guard. At Armour & Co., Chicago, all new workers are given guarded knives. The guards are made of aluminium, which gives ample protection with the least weight. Nine out of every ten accidents are due to the knife slipping through the meat and cutting the worker's left hand; therefore a safety device of this kind must have two objects in view—the device must be flexible to allow freedom and adaptation; and it must be made to pass government inspection. The guarding of steels is also of importance. Leather disks, $2\frac{1}{2}$ inches in diameter, made of discarded belting, are placed above the handle of the steel, which prevents the knife from striking the hand while steeling. Butchers are furnished also with leather sheaths so that no accidents may occur from an exposed knife carried by an employee who may be going about the plant.—B. L. G.

INDUSTRIAL ACCIDENT PREVENTION AS A PERSONNEL PROBLEM. *T. T. Read. Jour. Personnel Res., Nov., 1924, vol. 3, pp. 252–255.*

In this paper the human factor involved in accidents is discussed. The fact that accidents have not been prevented to an extent commensurable with the amount of money spent and energy expended for their prevention is explained by the fact that the human element involved is so difficult of control. The author, who is Safety Service Director of the United States Bureau of Mines, points out the experience resulting from the introduction of safety lamps in mines; he also cites the opposition by miners to the introduction of dust barriers. In conclusion he states that the personnel problems of accident prevention are not only the hardest to solve but are the principal elements in this laudable and difficult work.—H. B. E.

INDUSTRIAL SURGERY

THE RELATION OF THE SURGEON IN INDUSTRY TO THE FAMILY PHYSICIAN. *H. G. Giddings. Boston Med. and Surg. Jour., Oct. 16, 1924, vol. 191, pp. 736–738.*

Ever since the passage of the Compensation Act of Massachusetts conditions between the family physician and industry have been strained, and since the recognition of the industrial surgeon these conditions have not been improved, although there has been the best opportunity for an understanding. Relations between the family physician and the surgeon in industry should be such that the former may feel free to come to the industrial clinic for both legal and medical advice, so that he may feel free to send his patient to the clinic for consultation, and so that there may be complete co-operation between the two medical men resulting in the best possible service both to the injured worker and to his employer. Many physicians see but comparatively few industrial cases and it is often necessary for them to seek advice, both medical and legal. This advice they should be able to obtain from the industrial surgeon. Because of the lack of affiliation between medical schools and industrial clinics there is little study made of traumatic surgery, and it is feared that this condition may continue until both insurance companies and manufacturing plants maintaining clinics shall use the clinics for teaching purposes. During the present conditions the surgeon in industry should be both able and willing to act not only as mediator between the worker and his employer, but also as the common consultant of the family physician.—B. L. G.

AMPUTATIONS IN INDUSTRIAL SURGERY. *W. L. Estes. Abstr. as follows from Ann. Surg., Jan., 1925, vol. 81, p. 164, in Jour. Am. Med. Assn., March 14, 1925, vol. 84, pp. 848–849.*

Of 727 cases of single major amputations referred to by Estes, thirty-one patients died, a general mortality percentage of 4.26. There were double synchronous amputations with three deaths, a mortality rate of 6.5 per cent. There were three triple synchronous amputations and no deaths. Besides, there were eighteen cases of major amputation and some other operation of major importance done at the same time; these are called "mixed operations." There were three deaths. Rate 16.66 per cent. There were six cases of two amputations and some other major operations done at the same time; no deaths. There was one quadruple mixed operation; the patient recovered. All of the deaths except seven occurred within forty-eight hours from shock and exhaustion; seven patients were infected and died of septicemia. As far as reported, or any record could be obtained, nineteen patients had painful or diseased stumps (ulcerated stumps) and required reamputation.—K. R. D.

PREVENTION OF INFECTIONS FROM INDUSTRIAL ACCIDENTS. *E. W. Miller. Nation's Health, Oct., 1924, vol. 6, pp. 694–697.*

Attention is here confined to the prevention of industrial infections at their outset—to the vast number of minor wounds from which secondary infection arises—of which the commonest are the staphylococcic and the streptococcic infections. Reasons are given for the use of soap and water rather than reliance on antiseptics; the relative advantages of wet and dry dressings are discussed; and the treatment of wounds of the face, scalp, hands, feet, punctured wounds, burns, tetanus, etc., is also considered.—L. A. S.

Wound Infections Cause Lost Time in Industry. *A. W. Colcord. Nation's Health, Dec., 1924, vol. 6, pp. 846–848.*

In 1923 5 per cent. of the wounds reported to the compensation board of Pennsylvania were infected. These cases entailed loss of life, time, and money, and much suffering and crippling which the author considers to have been preventable and unnecessary. The chief causes of infection were: delay in reporting cases, poorly equipped dressing stations, poor surgical service, poor service given by insurance companies, and the first-aid work of laymen. Infection comes mainly from the small plants.—E. S. C.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Muscular Exercise, Lactic Acid and the Supply and Utilization of Oxygen.—Parts VII–VIII. *A. V. Hill, C. N. H. Long, and H. Lupton. Proc. Roy. Soc., Series B., Dec. 1, 1924, vol. 97, pp. 155–176.*

In this paper Professor Hill and his colleagues contribute two further sections to their intensive investigations of the chemistry of muscular exercise. They find that oxygen intake rises steadily as exercise is increased, attaining a maximum beyond which no effort can drive it. This maximum is conditioned by the limitations of the circulatory-respiratory system. They suggest the existence of a "governor" mechanism, either in the heart muscle or elsewhere, which co-ordinates the output of the heart with the degree of saturation of the blood leaving it. Under circumstances of severe exercise the output in man may reach 30 to 40 liters per minute. In order to perform such work the heart muscle must be supplied with at least twice its own volume of blood per minute.

They further find that the oxygen requirement of the body rises as speed increases, attaining values up to ten times the oxygen intake at the highest speeds. The oxygen requirement of walking greatly exceeds that of running at the same speed. Oxygen requirement is a measure of the energy needed to carry out a given series of muscular movements. In severe exercise the maximum concentration of lactic acid in the mus-

cles is attained with half a minute—a fact in keeping with the limiting duration of maximal muscular effort in athletes. Evidence is given in favor of the hypothesis that, once exercise and recovery are prolonged, chemical processes, other than simple oxidation of lactic acid or carbohydrate, come into play, and that these cause the oxidation of other substances.—E. L. C.

THE INFLUENCE OF SHORT TIME ON SPEED OF PRODUCTION. *H. M. Vernon and T. Bedford. Jour. Nat. Inst. Indust. Psychol., Oct., 1924, vol. 2, pp. 155–158.*

Observations were made on the output of groups of experienced piece-rate workers, who were sometimes put on short time. A group of thirty-eight girls engaged in making cartons was investigated for a two-year period, during which they worked an eight-hour day for 3, 3½, 4, 4½, or 5 days a week. They usually kept at each system of hours for two months or more, and it was found that their hourly output varied inversely as the amount of short time. When working for twenty-two hours a week, their relative speed of production was 96; when working twenty-eight hours, it was 99; when working thirty-three hours, it was 105; and when working thirty-nine hours, 108. A group of twenty-four girls engaged in labeling small packages was investigated for fourteen months, and it was found that when working twenty-seven hours a week their speed of production was 95; when working thirty-three hours, it was 98; and when working thirty-nine hours, 104. With longer working hours, however, the speed of production declined, being 102 when forty-three hours were worked, and 101 when forty-seven hours were worked. A similar effect was observed in a group of men engaged in the operation of making leather heels. Their speed of production was 92 when they worked twenty-two hours, 97 when they worked thirty-three hours, and 101 when they worked forty hours, but it fell to 97 when they worked forty-eight hours.

The explanation of these results appears to be that the workers lose some of their manual skill during the long week-ends when they are on short time, and gradually recover when they start work again. When working more than about forty hours a week, however, their output becomes reduced by fatigue.—H. M. V.

THE FORTY-EIGHT HOUR WEEK AND INDUSTRIAL EFFICIENCY. *P. S. Florence. Internat. Labour Rev., Nov., 1924, vol. 10, pp. 729–758.*

A mass of data, accumulated as the result of scientific investigation, bearing on the effect of hours of work on efficiency, is analyzed. Laboratory experiments are held only of value to confirm and help in the interpretation of industrial records. Nationality, age, and sex are thought to make little difference so long as work is not physically too heavy for women and boys. Output curves on semiautomatic machines are found to show a slight fall at the end of the day; on purely automatic machines to show no fall; but for muscular body work and dexterous hand work to show considerable falls. Where the fall is most pronounced reduction in

hours has a favorable effect on output. Conversely the longer the working day, the greater will be the variation between the output of the several hours, and in particular the greater the fall toward the end of each spell, especially for processes directly under human control. Evidence suggests that the ideal work curve approximates a horizontal line. In addition to output, other matters call for consideration, *e.g.*, lost time, accidents, spoiled and inferior work; all are increased with a fall in the output curve associated with long hours. Overhead expenses for heating, lighting, ventilation, and for the driving of belting and shafting increase with hours. Short hours are industrially economic if the output is equal to that of longer hours. Labor turnover is another economic loss which varies directly with length of hours.

The conclusion is arrived at that a forty-eight-hour week approximates an optimum length for ordinary industrial efficiency. It can be divided up in different ways; the only plan which has been found definitely inefficient is to introduce a spell of work before breakfast. Throughout this interesting article data are quoted from actual inquiries in different industries in support of the opinions expressed.—E. L. C.

SALT TREATMENT FOR MINERS' FATIGUE. *J. Court. Abstr. as follows in Correspondence in Jour. Am. Med. Assn., Dec. 27, 1924, vol. 83, p. 2112, from Colliery Guardian, Oct. 10, 1924.*

Men working in hot mines, where the humidity is low and the temperature is over 100°F., frequently suffer from undue fatigue and occasional attacks of cramps. It was recently suggested that the cramps might be due to excessive loss of sodium chloride through profuse and prolonged sweating, particularly when large quantities of water were drunk.

A few colliers were therefore chosen to test the effect of drinking a weak solution of salt in water, the proportion first tried being about 0.25 per cent., or 10 gm. per gallon of water. Such promising results were obtained that more men were prevailed on to put salt in their daily drinking water. Each collier carried a daily supply of 2 quarts, to which was added at home 1 teaspoonful to each quart of water.

The results were most gratifying. Six miners after a month's trial declared themselves to be less tired each day after work, and one no longer took his customary nap after reaching home. Another no longer had leg cramps, and the families of all reported greater energy evident at home.

Similar experiments on boiler stokers working at 96°F. in very dry air, in which ½ teaspoonful of salt was added to each quart of their daily ration of 2 quarts, showed that the workers all felt less tired on reaching home.

Whether the application of sodium chloride in certain forms of fatigue is a new discovery I am not in a position to say; but in case it represents a complete innovation, I am sending this bit of information.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

POSSIBILITIES IN THE USE OF HELIUM-OXYGEN MIXTURES AS A MITIGATION OF CAISSON DISEASE. *R. R. Sayers, W. P. Yant, J. H. Hildebrand. U. S. Bur. Mines, Rep. Investigations, Serial No. 2670, Feb., 1925, pp. 17.*

The animal experiments described indicate that by the use of helium-oxygen mixtures instead of nitrogen-oxygen the time of decompression is reduced to about one-fourth of that normally required. With men preliminary results indicate that safe decompression rates will be reduced in corresponding proportion. The practical application of this important discovery is that divers can safely work at greater depths and caisson work in tunnels can be carried on for longer periods and at higher pressure.

Physiologically helium appears to be as inert as nitrogen, has a molecular weight of 4 compared with 28 for nitrogen, a solubility in water of a little more than half that of nitrogen, and a much more rapid rate of diffusion. It is mainly to the last-mentioned property that the authors assign the markedly better results obtained with helium-oxygen as compared with nitrogen-oxygen.

The authors' experimental data presented in this paper are limited to small animals—rats and guinea-pigs—and were carried out in a small pressure chamber which is described in detail. A limited number of experiments on man point toward promising results and are to be continued further.

In one series of experiments with nitrogen-oxygen at 20 atmospheres, oxygen pressures corresponding to 2.7 per cent. oxygen (about 304 mm. partial pressure) gave poor results. With helium-oxygen at 20 atmospheres and 1.5 per cent. oxygen (about 228 mm. partial pressure) satisfactory results were obtained. At 15 per cent. oxygen (1140 mm.) pressures of 10 atmospheres gave good results with helium-oxygen and poor results with nitrogen-oxygen. Carbon dioxide partial pressures were kept down by placing sodium hydroxide in the pressure chamber. Various rates of decompression and times of exposure are given in the protocols.—P. D.

WOMEN AND CHILDREN IN INDUSTRY

INDUSTRIAL ACCIDENTS TO MINORS. *Jour. Am. Med. Assn., Oct. 4, 1924, vol. 83, p. 1088.*

In one year in Wisconsin, Massachusetts, and New Jersey, 7,478 industrial accidents occurred to workers under 21 years of age, according to the Children's Bureau, United States Department of Labor. Thirty-eight of these accidents were fatal and 920 resulted in partial disablement for life. Children of 16 and 17 years of age were prohibited from some employments in Massachusetts and Wis-

consin, but in all three states they were permitted to operate many of the dangerous industrial machines. Power-working machinery caused a larger percentage of accidents to the 16 and 17 year old minors than to children under 16, protected by law, or to workers between 18 and 21 who were better able to protect themselves, and the accidents were more serious to the 16 and 17 year group than to either the younger or the older workers.

LABOUR CONDITIONS AND LABOUR REGULATION IN CHINA. *Internat. Labour Rev., Dec., 1924, vol. 10, pp. 1005–1028.*

On the eastern border of China, European industrial methods are taking root, but factory regulations and inspection are undeveloped, and the conditions of child labor are far from satisfactory. Information relative to Shanghai has been published; here children are worse off in modern factories than in their native homes and tuberculosis is prevalent. Young female children are commonly purchased for employment as domestic servants. In small workshops and home industries the average child is apprenticed at the earliest age it can be of any value to its employer, and the conditions vary between those incident to slavery and those compatible with humane employment. In mills and factories children not more than 6 years of age are at work for twelve hours a day with one hour off for a meal; sometimes there is one day off in two weeks; sanitary conditions are deplorable and wages exiguous. Contractors hire the children from their parents for $2 a month. Cotton mills work two twelve-hour shifts, with one shift off a week; there may be an hour interval for a meal or the employees take food as they can. Mothers bring their infants with them, and rows of baskets containing babies and children, sleeping or awake, lie placed between the rapidly moving and noisy machinery. Young workers overcome by fatigue lie asleep at every corner in the open or hidden in baskets of raw cotton. The children have to stand throughout their work; and in silk filatures they present a pitiable sight, miserable physically and mentally. Still, there is another side: At one large native printing works no one under 14 years of age is employed; a crèche is supplied for the babies of nursing mothers; the work is light and the hours are not excessive.

White phosphorus is still being used in certain match factories, and poisoning results. In laundries no girls are employed and boys start at about the age of 13; their parents receive $60 to $70 for three years' apprenticeship, during which period they are fed and lodged, frequently in the same room, by the employer. Hours of work are unlimited, from dawn often until late at night. In the building trade, food given to apprentices by contractors is frequently poor and is worse in times of unemployment.

Clearly there is great need for legislative control to bring Chinese labor within sight of civilized usage. The principles of regulations have, however, now been accepted; there remains the vital question of enforcement.—E. L. C.

LABOR CONDITIONS IN CHINA. *T. Chen. U. S. Month. Labor Rev., Nov., 1924, vol. 19, pp. 980–993.*

In the Yangtzepoo District, Shanghai, foreign cotton mill owners have established a free hospital and dispensary for their 15,000 employees. Of the workers, 55 per cent. are women and 20 per cent. children. Of 374 industrial accidents which were treated, 231 were men, 43 were women, and 100 were children. The death rate for the children's accidents was twice that of the rate for men; no accidents to women were fatal. Accidents among children are more frequent for they are inexperienced and tire easily under continuous employment. Owing to the nature of the cotton industry, most of the wounds are lacerations, 75 per cent. of which become infected. Sweating and the use of yellow phosphorus are additional problems of industrial hazard. The trend of legislation is (1) the prohibition of employment of children under 12 years of age; (2) one day's rest in seven; and (3) the limitation of working hours.—B. L. G.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

QUANTITATIVE ANALYSIS OF MISTS AND FOGS, ESPECIALLY ACID MISTS. *H. C. Weber. Jour. Indust. and Engin. Chem., Dec., 1924, vol. 16, pp. 1239–1242.*

This paper describes two types of apparatus used by the author to determine plant losses in acid mists or fogs such as hydrochloric, sulphuric, and nitric. Filters used were made of porous membranes such as asbestos built up on Büchner funnels, alundum thimbles, and mats consisting of two or three filter papers. The asbestos filters were abandoned because of cracking and channeling of the asbestos, while the alundum thimbles and filter papers were found satisfactory, especially for hydrochloric acid and sulphuric acid mists. The alundum thimbles, however, offered no way of distinguishing between hydrochloric acid gas and mist.

Because the filter-paper mats tended to clog with nitric acid vapor, a small electric precipitator was used. The high tension current, said to be approximately pulsating direct in effect, was furnished by a 2-volt or a 6-volt battery and Ford induction coil. The precipitator tube was made of thin $\frac{3}{4}$ inch diameter lead glass, 18 inches long, and having side arms for passage of the vapors containing the acid mist. The precipitating wire was made of platinum and supported centrally by a rubber stopper at the top of the tube and a glass rod at the bottom. The bottom of the tube was supported in a rubber stopper inserted in a beaker for catching the precipitated mist.

Both the filter and precipitator devices were checked for efficiency against a Tyndall light beam and found to be satisfactory. In all cases samples were taken by a centrifugal suction pump run by a $\frac{1}{8}$ horse-

power electric motor and the volume of air was measured by a flow meter.

In the filters, the acid absorbed was determined by titrating the filter medium (or liquid in which the filter was placed). In the electric precipitator the collected acid was washed down and titrated in the beaker used to support the precipitator tube.—P. D.

GOOD SANITATION PAYS, ECONOMY AND HEALTH DEMAND IT. *Nation's Health, Oct., 1924, vol. 6, pp. 713–714.*

If increased output and cheaper production are to be achieved, one of the most important prerequisites in management is sanitary efficiency. The plant where people like to work is one supplied with drinking fountains, lockers, adequate toilet facilities, shower baths, good lighting, etc. Once the installation has been made, scrupulous attention must be given to cleanliness. The cleaning must be done strictly according to a routine which has been previously determined by experts.—L. A. S.

THE ILLUMINATION OF FACTORIES. *L. Gaster. Jour. State Med., Dec., 1924, vol. 32, pp. 574–581.*

Good lighting is essential to health, safety, and efficiency of work, and it may be pointed out that in general the cost of proper illumination forms a very small proportion of the cost of labor, in many cases only about 1 per cent. Good illumination is likewise essential to cleanliness. Better lighting enables work to be done, not only more expeditiously but more easily.

It is generally considered that a person with normal sight can read good type on white paper by an illumination of 3 foot candles with ease. But if the type is small, or if one has to examine more or less illegible handwriting, or if the paper is dark-colored or of poor surface, a much higher illumination may be desirable. Excessive contrasts in brightness and the elimination of inconvenient shadows are quite as important. It is also generally recognized that the dazzling effect of unscreened bright illumination placed in the direct range of vision is both prejudicial to vision and liable to cause accidents. Artificial light is under much better control than daylight, which varies so greatly with the time of day, season of the year, and climatic conditions. It is quite possible that if our artificial lighting were sufficiently well designed, the results would be as good as by average daylight, and possibly even better. The leading gas companies now undertake regular maintenance of lighting installations.

Valuable work has been carried out by the medical profession on the curative effect of sunlight in the case of certain diseases, and its general beneficial influence on health. Recognition of these facts has led to the formation in England of a Sunlight League, to make known the value of sunlight for life and health, and to co-operate with health societies, schools, etc., that approve of this object. To those concerned with artificial lighting these effects of sunlight are also of great interest, and the study of daylight conditions already forms an important section of illuminating engineering.

It is to be expected that during the next few years there will be a general

development of interest in lighting problems in other countries, so that the need for international treatment of the subject will become even more evident.—D. A. C.

THE MAINTENANCE OF INTERIOR LIGHTING SYSTEMS. *Nation's Health, Nov., 1924, vol. 6, pp. 782–784.*

This is a summarized account of a paper under the title "Depreciation of Lighting Equipment Due to Dust and Dirt," by E. A. Anderson and J. M. Ketch, in *Transactions of the Illuminating Engineering Society,* January, 1924, vol. 19, pp. 55–65, in which the authors showed the deterioration of lighting equipment due to collection of dirt on the reflectors, walls, ceilings, etc.—P. D.

STUDY OF THE EFFECT OF DEGREE OF ILLUMINATION ON WORKING SPEED OF LETTER SEPARATORS IN A POST OFFICE. *J. E. Ives. U. S. Pub. Health Rep., Nov. 14, 1924, vol. 39, pp. 2825–2851.*

The author uses the speed in which experienced mail clerks handled and sorted letters of various sizes under different intensities of illumination as a method of judging optimum conditions of illumination.

The study was made "by weighing the total letter mail sorted by a group of eight clerks at certain separation cases, every half hour, from 1 P.M. to 4 P.M., and by another group of eight clerks, from 4 P.M. to 9 P.M., for four consecutive days under a given illumination. It was decided to make tests simultaneously in the dispatching division on the mezzanine floor of the post office, and in the delivery division on the first floor. The tests on each floor were made at the same set of letter cases."

The process of sorting the letters carried on in the tests in the dispatching division was a primary one, involving 34 separations; that carried on in the delivery division was a secondary one, involving 50 separations.

Six series of tests were made, in January, February, June, September, November, and December, respectively.

The intensity of illumination at the working place varied from about 3 to 8 foot candles. At the higher intensities the curve of production (pounds of mail handled per man per hour) plotted against illumination in foot candles flattens out, indicating that the maximum production is attained in this particular work at about 8 foot candles.

The author gives a comprehensive and interesting discussion of the applicability to this type of problem of the formula:

$$P = P_c\,(1 - e^{-kI})$$

where P represents production; P_c, a constant value which production rate approaches as the illumination increases; e, the base of the natural system of logarithms; k, a constant determining the slope of the curve; and I, the illumination in foot candles. By tables the author shows that results calculated from this formula are in very close agreement with those determined experimentally.—P. D.

THRESHOLD AIR CURRENTS IN VENTILATION. *A. M. Baetjer. Am. Jour. Hyg., Nov., 1924, vol. 4, pp. 650–673.*

This investigation was undertaken (1) to derive a formula for determining very low air velocities by kata-thermometer readings and (2) to determine the threshold velocities under varying conditions of temperature and moisture with their physiologic effect on skin temperature.

The formula for using the kata at low velocities was determined by drawing air through a galvanized iron manifold $4\frac{1}{2}$ inches long and 2 inches in diameter in which were placed a kata and control thermometer. The rate of air flow was measured by a wet gas meter. Determinations of threshold currents were made by conditioning air in a small cabinet to the desired combination of wet and dry bulb and then blowing it against the skin at a controlled velocity.

In the reviewer's opinion the data presented in this paper should be of much practical usefulness in ventilation work, particularly in the ventilation of crowded rooms where mechanical ventilation methods are necessary.

The author concludes that:

1. The velocity of currents of air from 0.03 to 0.60 meter per second may be determined in small pipes (2–4 in. dia.) by the kata-thermometer by the following formula:

$$\frac{H}{\theta} = 0.179 + 0.529\sqrt{V}$$

2. The value of the threshold velocity varies with the temperature, but is independent of the humidity of the current air. The threshold velocity for the skin of the cheek varies from 0.15–0.65 meter per second with current air temperatures varying from 12° to 30°C. When current air temperature equals normal room air temperature, the threshold velocity varies from 0.2 to 0.3 meter per second.

3. Threshold currents with a temperature above that of the room by 1.1° to 7.8°C. cause a rise of temperature in the part of the skin acted upon, due presumably to vascular dilatation.

4. Threshold currents with a temperature below that of the room by 1.2° to 7.0°C. cause a fall of skin temperature, not confined to the part of the skin acted upon, due presumably to vascular constriction.

5. The experiments indicate that the air movement in a well-ventilated room should not fall below the threshold value for the skin of the cheek.

—P. D.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

HEALTH SERVICE FOR 5,000 EMPLOYES. *W. Offutt. Hosp. Management, Oct., 1924, vol. 18, pp. 66–68.*

Miss Offutt is the industrial nurse in charge of the first-aid department of the Standard Sanitary Manufacturing Company of Louisville, Ky. After explaining the attitude of employers generally toward welfare work, the author describes the equipment of the first-aid department. This department is housed in a separate building and the medical work has been in charge of a prominent physician of Louisville. There are four rooms centrally located, fully equipped with complete operating and dispensing rooms, office, and rest room. Every man and woman applying for work first undergoes a

physical examination. In the year 1923, 4,866 accidents were cared for. Only 965 were of a serious nature in which the employee lost a day or more. The average number of people employed at the factory is about 5,000 men and women, about 1,000 of whom are negroes. Careful records of accidents are kept, requiring a staff of three clerks.—H. B. E.

ADEQUATE HOSPITAL TREATMENT FOR INJURED WORKERS. *J. R. Kerr. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 222–228.*

When twelve and a half million pounds in Great Britain and five hundred million dollars in the United States was the cost in 1921 of compensation for accidents, the interests of conservation of man-power call for organized means for treating industrial accidents. The injured should be quickly and properly repaired; just as in war time no effort should be spared to reestablish their fitness for service. Lump sum settlement should be replaced by adequate hospital treatment where patients can be more effectively and more rapidly restored than in the home. A body of opinion is tending to this view, but much more rapid progress is required. Adequate treatment should become an integral part of compensation.—E. L. C.

MEDICAL SERVICE AND SAFETY IN THE CHEMICAL PLANT. *B. J. Slater. Nat. Safety News, Dec., 1924, vol. 10, pp. 21–22.*

The physician in industry is now a part of the production and safety program, rather than an individual. If he is to render any aid to the chemical industry he must be adequately equipped with personnel and laboratory. The medical department should be able to determine what illnesses relate to occupation and what do not. A thorough physical examination aids in placing men at suitable employment. Many men because of chronic physical conditions should not be employed; this is real service to the employee. There should be such a close cooperation between the safety and the medical departments that all cases of even minor injuries will be made available by the medical department to the safety department. An annual complete physical examination of each employee and such other special examinations as are necessary will furnish a close check on the condition of the workers. Efforts spent in the prevention of disease and its early diagnosis are the wisest kind of safety measures. —B. L. G.

WELFARE DEPARTMENT OF PROXIMITY MANUFACTURING COMPANY. *Nation's Health, Oct., 1924, vol. 6, pp. 704–705.*

The Proximity Manufacturing Company operates cotton mills and print works at Greensboro, N. C., and has developed a system of welfare administration which is unusually efficient. The department has on its staff three trained nurses and seven welfare workers. The medical work of the concern is handled by outside physicians who are on call as needed. The activities of this department, which are very diverse and take place partly within the home and partly in the company buildings, are briefly enumerated.—L. A. S.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

OCCUPATIONAL DISEASE AND WORKMEN'S COMPENSATION LAWS. *F. L. Rector. Am. Jour. Pub. Health, Sept., 1924, vol. 14, pp. 763–765.*

Forty-two states have compensation laws regarding industrial accidents; but only eight of these states recognize compensable occupational diseases, and in only four of these is a list of such compensable diseases maintained (Illinois, Minnesota, New York, Ohio). Many cases declared compensable in one state are in other states not recognized as diseases of industry. The tendency among legislative reformers is more and more to group disease conditions under the head of occupational, regardless of when or where they occur. It is only a question of time until the laws will be loaded with diseases which have only a remote connection with industry. It should be remembered in dealing with a so-called occupational disease that many conditions, the cause of which is assigned to industry, have their beginning in faulty domestic conditions, either of housing, diet, or habits of the persons affected. In the final analysis these conditions should, therefore, be given due consideration. In addition it is the duty of public health authorities to aid industries that are trying to better health conditions, by lending all possible assistance in the supervision of the workers outside their hours of employment.—B. L. G.

"STATISTICS OF COMPENSATION," WORKMEN'S COMPENSATION ACT, DURING THE YEAR 1923. *Cmd. 2306. H. M. Stationery Office.*

The British Home Office publish every year statistics of compensation under the Workmen's Compensation Act. These statistics consist of tables summarizing the total payments for accident and disease under the headings of the seven great industries: shipping, factories, docks, mines, quarries, constructional work, and railways. The factories are further subdivided under ten headings the most important of which are: cotton, metals, other metal work, and engine and shipbuilding.

Table I gives the total number of persons employed as 1,803,517; the fatal accidents 2,636; disablement cases 460,534; industrial disease cases 16,844; and the total cost of all compensation as £7,134,096 (£6,495,728 in 1922).

Table II gives the number of cases continued from previous years and the number of dependents in cases of fatals.

Table III gives the payments for compensation in cases of industrial disease. Out of a total of £631,663, mines were responsible for £594,943 and for 93.9 per cent. of all cases.

Table IV gives the duration of compensation (exclusive of cases terminated by payment of a lump sum). Of 389,262 cases terminated in 1923 only 23,685 lasted over thirteen weeks. There is a marked difference between the duration of cases of accident and cases of disease. The proportion of accident cases lasting over twenty-six weeks was 1.91, the proportion of disease cases was 28.1.

Table V gives the payments in lump sums for compensation; 19,394 cases of accident were settled for £917,469, and 893 cases of industrial disease for £89,669.

Table VI gives the number of cases of industrial disease classified according to disease and employment. Thirty-four industrial diseases are scheduled and 16,865 cases received compensation during the year. Of this number the mining industry was responsible for 16,720 and miners' nystagmus for 11,142.

Part II gives general statistics as to the administration of the Act and deals with legal proceedings, applications for arbitration, and certificates granted by the certifying surgeons.

In the general introduction to the tables by the undersecretary, comparisons with the statistics of previous years are given. The total number of accidents in 1911 was 423,052; in 1923, 480,035; but the payment of compensation had risen from £3,056,404 to £7,134,096. In the mining industry this increased cost has been very marked and the charge on each person employed has risen from 29/6 in 1919 to 62/9 in 1923. In docks and constructional work the increase has been equally marked but the average cost per head of all persons employed is 19/5. The total cost, if charges and expenses are taken into account, of compensation in the seven great industries "can hardly be less than £9,000,000." The charge on the coal mining industry works out at about 3.2d per ton of coal raised and for every £1 of wages the amount of compensation is 5.7d. The amount paid for railways was 1d to every £1 of wages.

The number of fatal accidents in all industries per thousand persons employed was 0.4.—T. L. L.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

THE HEALTH OF MERCHANT SEAMEN. *W. E. Home. Lancet, Nov. 8, 1924, vol. 2, pp. 981–982.*

DISEASES OF MERCHANT SEAMEN. *W. E. Home. Jour. Roy. San. Inst., Nov., 1924, vol. 45, pp. 265–270.*

The author in these two articles points out how thoroughly unsatisfactory are the British Board of Trade returns for estimating the health, or rather the ill health, of merchant seamen. Even such information as is given is antiquated in classification. The records for the army, navy, and air force present an agreeable contrast. Using such material as is available, which certainly underestimates the mortality of the merchant marine, the rates are given for 1921 in Table 1.

TABLE 1.—MORTALITY RATES PER THOUSAND LIVING FOR MERCANTILE MARINE, BRITISH NAVY, AND BRITISH ARMY, 1921

	MERCANTILE MARINE			BRITISH	
	British Seamen	Lascars	Foreign Seamen	Navy	Army
All deaths	4.98	6.72	8.41	3.57	4.30
All diseases (less accidents)	2.08	4.67	3.16	2.00	2.77
Pneumonia	0.32	1.16	0.51	0.31	0.53
Tuberculosis	0.15	0.62	0.19	0.28	0.24

As the population at risk for the mercantile marine is based on "the

first crews of vessels," every interruption of service makes the number of men given too high; the rates, therefore, cannot be less than those stated and may be much higher. The Board of Trade is held not to be staffed for preparing such records, which should, therefore, be transferred to the Ministry of Health.—E. L. C.

FREQUENCY OF DISABLING ILLNESSES AMONG INDUSTRIAL EMPLOYEES. *U. S. Pub. Health Rep., Oct. 31, 1924, vol. 39, pp. 2721–2730.*

Since Jan. 1, 1920, a group of industrial mutual benefit associations and company relief departments has been sending monthly morbidity reports to the United States Public Health Service. The cases reported are those for which sick benefits have been paid covering disabilities lasting longer than one week. In other words, only those cases have been included which render employees unable to work for eight consecutive calendar days or longer.

These reports are summarized as follows:

1. Statistics of sickness incidence based on the reports of industrial sick benefit associations are understatements of the amount of sickness actually occurring, on account of the common practice of refusing cash benefits for the venereal diseases, for illness resulting from the violation of any civil law, for the results of wilful or gross negligence, for chronic diseases contracted prior to the date of joining the association, and for certain other causes; but they do afford some knowledge of the relative frequency of different diseases in a sample of the industrial population of this country.

2. In the four years under review (1920–1923), the frequency of influenza and grip was outstanding. In 1921, when there was no epidemic, the curve for influenza and grip rose as high as the curve for all other respiratory diseases combined. In the non-epidemic year of 1921, as well as in 1920, 1922, and 1923, "flu" or grip caused a much larger number of claims on the funds of industrial mutual associations than did any other disease.

3. The combined incidence rate of typhoid fever, smallpox, malaria, measles, and all the other epidemic and endemic diseases (except influenza and grip) included in title numbers 1 to 19, inclusive, in the International List of the Causes of Death, 1909 revision, was less than the frequency of appendicitis.

4. The marked seasonal variation in the occurrence of disabilities lasting longer than one week in the four years under review was due in large degree to influenza and grip, though the combined effect of all the respiratory diseases was to produce extremely high sickness rates in January, February, and March. If the respiratory diseases could be eliminated, the present records indicate that there would be relatively little seasonal variation in the incidence of illness which disables for eight days or longer.

5. Sickness occurred oftener among the female employees than among the males although the rates included only diseases common to both sexes, and the age distribution of the women engaged in industry is younger, probably, than that of the men.

6. There were striking differences in the sickness rates by establishments.—B. L. G.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

WHAT MEDICAL SCIENCE CAN DO FOR INDUSTRY. *W. F. Dearden. Health and Industry Series, No. 1. Association of Certifying Factory Surgeons, Manchester.*

This interesting pamphlet sets out the rise of industrial medicine from the time of Ramazzini until the present day. Dr. Dearden shows how the profession, particularly in recent years, has acquired a vast amount of new knowledge which it holds at the disposal of industry. Much has become known as the result of investigations inaugurated during the war period and continued and expanded since. Practical application would mean great economic advantage and benefit in health; but knowledge is ahead of practice. There is today no recognized factory medical service. The fault lies with the captains of industry who are failing to perceive its value and to engage men to pursue it. The credit balance of information is all on the side of the profession; the time is

ripe for industry to do something to equalize the balance.—E. L. C.

FACTORY INSPECTION IN THE CZECHOSLOVAK REPUBLIC IN 1923. *Internat. Labour Rev., Jan., 1925, vol. 11, pp. 83–90.*

The activities of the inspectorate in this young republic indicate progressive action. The code of industrial legislation is reported to be on the whole well complied with. Men composed some 67 per cent. of those employed, women about 28 per cent., leaving only 3.5 per cent. for boys and 1.5 per cent. for girls; the proportion of young workers continues to fall. Contraventions of the Act were of course found, but were remedied by the intervention of the inspectors. Vocational education of apprentices is advancing and apprenticeship itself is becoming more general. The forty-eight-hour week is observed, and Sunday rest in factories has become general. The year reported on was one of industrial depression and three unfavorable influences—a fall in wages, unemployment, and housing shortage—acted adversely on the health of the workers, which was least satisfactory in Slovakia and Sub-Carpathian Ruthenia where alcoholism is prevalent. Taken as a whole the report indicates that labor conditions in Czechoslovakia are being brought up to modern standards.—E. L. C.

FACTORY INSPECTION IN VICTORIA IN 1923. *Internat. Labour Rev., Jan., 1925, vol. 11, pp. 91–92.*

This annual report deals with observance of the various Acts which the factory inspectorate has to supervise. It deals with the conditions of trade and wage boards to a greater extent than with the hygiene of work. Industrial accidents are dealt with and means for their prevention discussed. Otherwise health matters are not referred to.—E. L. C.

ADMINISTRATION OF LABOUR LAWS IN QUEENSLAND IN 1923–1924. *Internat. Labour Rev., Jan., 1925, vol. 11, pp. 92–94.*

Improvement is reported in the hygiene of factories and shops inspected. The report deals largely with rates of wages and such matters. Apparently there are no medical members on the inspectorate staff.—E. L. C.

FACTORY INSPECTION IN SOUTH AUSTRALIA IN 1923. *Internat. Labour Rev., Jan., 1925, vol. 11, pp. 94–95.*

Statistics are given relating to the factories inspected and the number of persons employed, but there are no notes on hygiene or welfare work. The subject of safeguarding machinery receives considerable attention, but the subject of wages would appear to occupy the time of the staff to an undue extent.—E. L. C.

INDUSTRIAL INSPECTION IN THE NETHERLANDS IN 1922. *Internat. Labour Rev., Dec., 1924, vol. 10, pp. 1035–1043.*

An inspectorial staff of eighty-six supervised 103,155 factories and workshops employing some 700,000 persons. The staff included medical, electrical, chemical, and agricultural experts. The standard of work is high and legislative requirements are enforced. Occupational diseases were not nu-

merous, only 283 cases were notified, including 14 cases of lead poisoning, 2 of anthrax, 5 of miners' beat knee, and 5 of nystagmus. Inquiries were conducted in briquette factories where inflamed conjunctivae were found; in brass founding into brassfounders' ague; in zincography into risk from nitrous fumes; in the artificial silk industry into effects of sulphuretted hydrogen; and into lead poisoning among house painters. The report contains much information on non-medical subjects.—E. L. C.

INDUSTRIAL INSPECTION IN THE NETHERLANDS IN 1923. *Internat. Labour Rev., March, 1925, vol. 11, pp. 389–396.*

The report refers to great economic depression during the period reviewed. Organized inspection by a permanent staff is described. Difficulties occurred in regard to compliance with enactments regarding hours of work, but for the most part the forty-eight-hour week is observed. The employment of young persons in prohibited occupations was frequent and became a cause for interference. Provision of adequate ventilation and heating, owing to financial stress, was difficult to enforce; the same applied to provision of cloakrooms. Nevertheless progress has been effected. The prevention of accidents and instruction in first aid were followed up. Reference is made to the triennial medical examination of adult stonemasons; the results fully justified the recommendation that adult stonemasons should be regularly examined. The report contains notes and short chapters dealing with such industries as herring skewering and smoking, peat digging, oak barking, and bulb peeling; in this last industry legal employment of children used to prevail.—E. L. C.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

HEALTH OF FEMALE WORKERS IN THE PHOTOGRAPHIC (RED LIGHT) INDUSTRIES. *E. Krüger. Zentralbl. f. Gewerbehyg., Dec., 1924, N. S. vol. 1, pp. 103–105.*

It is believed that because of lack of sunlight these women are subject to anemia, nervousness, and eye trouble but examination failed to demonstrate any such changes.—H. E. H.

BLOOD EXAMINATION OF THE PERSONNEL OF RÖNTGEN AND RADIUM INSTITUTES. *E. Rud. Abstr. as follows from Ugesk. f. Laeger, 1924, p. 438, in München. med. Wchnschr., Oct. 31, 1924, vol. 71, p. 1552.*

Eighteen persons were examined, six of whom were physicians, and six nurses. No signs of serious injury to the blood were found. The hemoglobin and erythrocyte percentages varied between normal limits; the leukocyte count was about 1,000 below the normal average.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

GAS MASKS FOR GASOLINE AND PETROLEUM VAPORS. *S. H. Katz and J. J. Bloomfield. U. S. Bur. Mines, Tech. Paper 348, 1924, pp. 37.*

The facts presented in this paper, as the result of experimental investigation, show the limits of protection afforded by gas masks, hose masks, and self-contained oxygen-breathing apparatus against the inhalation of gasoline and other petroleum vapors.

The results show that the canister type of gas mask filled with dry, fresh, activated charcoal affords protection for one hour or more when the concentrations of gasoline vapors do not exceed 1 per cent. The hose mask and the self-contained oxygen-breathing apparatus, the latter with rubber-coated bags at least 1/16 inch thick, protect in any irrespirable atmosphere which the skin can endure.

A discussion is also given of the best protective devices for various conditions encountered in the petroleum industry. For protection against hydrogen sulphide and petroleum together, the authors recommend gas masks with canisters filled with both soda lime and charcoal. Canister gas masks should not be used in air exceeding 2 per cent. of hydrogen sulphide or hydrogen sulphide plus petroleum vapor.—C. P. Y.

HYDROCYANIC ACID POISONING. *G. V. Bein. Abstr. as follows from Zentralbl. f. inn. Med., Nov. 22, 1924, vol. 45, p. 970, in Jour. Am. Med. Assn., Jan. 17, 1925, vol. 84, p. 241.*

Bein reports the history of a man who died from acute yellow atrophy of the liver. The disease had followed immediately after a poisoning with the fumes of hydrocyanic acid.—K. R. D.

PROTECTION OF WORKERS FROM THE SPRAY OF DYES AND VARNISHES. *Pasch. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 82–83.*

In establishments where dyes and varnishes are put on by a spraying apparatus—*e.g.*, in varnishing, porcelain work, and coloring of post cards—the workers are apt to be injured by the substances. Karl Rein has an improved suction apparatus by which all the excess spray is efficiently removed. It has worked well in practice and therefore the workers are glad to use it.—H. E. H.

EPIDEMIC OF MUSCULAR RIGIDITY. *Lawetzky. Abstr. as follows from Deutsch. med. Wchnschr., Oct. 17, 1924, vol. 50, p. 1444, in Jour. Am. Med. Assn., Nov. 29, 1924, vol. 83, p. 1803.*

Lawetzky describes a peculiar disease which has been affecting since last August the population at the eastern parts of the Haff, a fresh-water lake near Königsberg. The affection begins with pains in the extremities and a sudden rigidity of all their muscles. Headaches and vomiting are frequent. The rigidity soon subsides and the patients are able to work in a few days. Only three of them died, most probably from other causes. Hemoglobinuria is present regularly in the beginning, but there is no fever. The disease has occurred so far only in the eastern part into which the Königsberg sewers drain.

The sewage may contain selenium. Chiefly fishermen were affected; several attacks were observed in some of them. There is also a high mortality among the water birds.

HAFF DISEASE. *F. Seeger and G. Tidow. Abstr. as follows from München. med. Wchnschr., Oct. 17, 1924, vol. 71, p. 1455, in Jour. Am. Med. Assn., Nov. 29, 1924, vol. 83, p. 1804.*

Seeger and Tidow report on the "Haff disease," on which an abstract is published above. They attribute the muscular rigidity to the pains. Moderate leukocytosis with prevalence of polymorphonuclears was found. The urine contained methemoglobin. The temperature was always normal. Recurrences were frequent. Tidow injected 5 c.c. of blood from one of the patients into himself. No disease resulted.

HAFF DISEASE. *G. Rosenow and L. Tietz. Abstr. as follows from Klin. Wchnschr., Oct. 28, 1924, vol. 3, p. 1991, in Jour. Am. Med. Assn., Dec. 13, 1924, vol. 84, p. 1960.*

Rosenow and Tietz discuss the epidemic of muscular rigidity reviewed in the *Journal of the American Medical Association*, November 29, p. 1804 (see preceding abstract). They point to the methemoglobinuria and the presence of inclusions of hemoglobin clumps (Ehrlich-Heinz) in the erythrocytes. They conclude that the disease is due to a gaseous blood poison—perhaps arseniuretted hydrogen, or a similar compound.

THE CAUSE OF THE HAFF DISEASE. *Berlin Letter, Jour. Am. Med. Assn., Jan. 17, 1925, vol. 84, p. 216.*

Further investigations of the cause and nature of the Haff disease have resulted in an apparently satisfactory explanation. According to statements made in an address delivered by Professor Lentz the disease is the result of poisoning by arsine, which had been introduced into the Haff through the waste water from two cellulose factories. The poisoning is caused by arsine, which, owing to the use of iron pyrites, develops continually from the arsenic contained in the waste water and is breathed in by the fishermen. Waste water from the cellulose factories was found to contain 28 mg. of arsenic per liter, so that it is estimated that about 56 kg. of arsenic was emptied daily into the Haff. The factories have been prohibited from emptying arsenic-containing waste water into the Haff, and if now no further cases of the Haff disease arise this will furnish a confirmation of the present assumption in regard to the nature and cause of the outbreak. The immediate future will decide. Some doubts are still entertained as to the correctness of the explanation because of the fact that no traces of arsenic have been found in the patients suffering from the disease. It has also been emphasized that in the region of Danzig, on the western shore of the Haff, cases of the disease have been noted, although a careful examination of water and soil for a distance of 2,000 meters from the point where the Pregel River (which receives the waste water from the cellulose factories) empties into the Haff has failed to reveal the presence of arsenic.—K. R. D.

HAFF DISEASE. *O. Lentz. Abstr. as follows from Med. Klin., Jan. 4,*

1925, vol. 21, p. 4, in Jour. Am. Med. Assn., Feb. 21, 1925, vol. 84, p. 633.

Lentz gives a survey on the epidemic of muscular rigidity and methemoglobinuria observed recently among the fishermen of the Haff. Lewin's hypothesis of a poison containing arsenic proved correct. Two cellulose factories had been using in the last years Spanish pyrite containing much arsenic. The water of the river Nogat had been diverted to regulate another river, so that the waters of the Haff are stagnating. Comparatively large amounts of arsenic have been found in the water and sediments of the Haff, and in the urine and organs of the patients. Schnabel injected 1 c.c. of the filtered water into himself and into one of the convalescents. It produced a typical attack in the latter. The cause is a gas consisting of an organic compound of arsenic (not AsH_3).—K. R. D.

HAFF DISEASE. *L. Lewin. Abstr. as follows from Deutsch. med. Wchnschr., Jan. 23, 1925, vol. 51, p. 133, in Jour. Am. Med. Assn., March 14, 1925, vol. 84, p. 860.*

Lewin reports on the method by which he came to the conclusion that the Haff disease must be due to poisoning with a volatile arsenical compound. The oxyhemoglobin of the blood and urine of the patients displayed a remarkable resistance to reduction by ammonium sulphide. The urine did not decompose.—K. R. D.

THE "HAFF DISEASE." *Lancet, March 14, 1925, vol. 1, p. 566.*

Fishermen of the Kurisches Haff in Eastern Prussia experienced severe muscular pains, scanty urine with albuminuria and casts; 600 cases occurred with three deaths. The agent of the disease was finally discovered to be arseniuretted hydrogen. Certain cellulose factories had been using Rio Tinto pyrites containing arsenic; the effluent gained access to the bay, and 28 mg. of arsenic was found per liter of water; there the marine algae took up the poison and generated arseniuretted hydrogen. Arsenic was found in the blood, urine, and various organs of men and animals who died from the disease. Cyprian pyrites has been substituted and the disease has disappeared.—E. L. C.

HYGIENE OF SCRAPPING SHIPS. *Engelsmann. Abstr. as follows from Klin. Wchnschr., Nov. 11, 1924, vol. 3, p. 2105, in Jour. Am. Med. Assn., Jan. 3, 1925, vol. 84, p. 71.*

Engelsmann investigated the danger of lead poisoning in workers wrecking ships with burners. The approximate amount of lead in the air inhaled is 0.86 mg. per hundred liters. Masks with valves close to the nose are unsuitable; a long tube is preferable unless it hampers free breathing. The urine should be examined microscopically every month. Signs of a kidney lesion are more important than any other symptoms of poisoning.—K. R. D.

DIAGNOSIS OF LEAD POISONING. *F. Schiff. Abstr. as follows from Med. Klin., Nov. 16, 1924, vol. 20, p. 1621, in Jour. Am. Med. Assn., Jan. 3, 1925, vol. 84, p. 72.*

Schiff recommends Hoffmann's method (dark-field examination of stained specimens) as the easiest way to detect basophilic stippling.—K. R. D.

EXPERIMENTAL CONTRIBUTIONS TO THE STUDY OF CHRONIC LEAD POISONING. *K. B. Lehmann. Arch. f. Hyg., 1924, vol. 94, pp. 1–40.*

This is a collection of papers on lead poisoning edited by Dr. Lehmann.

Powdered lead sulphide was found not to be toxic when fed to animals. This might be expected from the resistance of lead sulphide to acids, and from the lack of lead poisoning in workers in lead mines. Animals which were fed powdered metallic lead or white lead died of lead poisoning; cats after an average of about 2.3 gm. of lead per kilo, and dogs after 3.7 gm. per kilo.

The staining of blood smears is discussed. Smears do not need to be fixed at once and 95 per cent. alcohol may be used several weeks after making the blood film without losing the stippling. Different methods of staining blood smears are described; the authors recommend a mixture of:

Toluidine blue	5.0 gm.
Borax	0.5 gm.
Distilled water	1,000.0 c.c.

They found that rats and guinea-pigs showed marked stippling, birds less, and cats only slight, inconstant changes. Increased stippling after hemorrhage corroborates the findings of Key, that it occurs in young red cells rather than in old degenerating forms. It is obvious from their work that the stippled cells are young cells, but it is not clear whether they are degenerative forms. The stippled granules apparently come from the spongioplasm and not from the nucleus.

Neurologic changes were observed in all types of animals, but were most thoroughly studied in cats. Pathologic changes could be observed in the central nervous system, but recovery from these was apparently possible, as the symptoms disappeared after lead administration stopped.—J. C. A.

SAMUEL STOCKHAUSEN'S TREATISE ON LEAD COLIC (1656). A CONTRIBUTION TO THE HISTORY OF INDUSTRIAL MEDICINE. *Koelsch. Zentralbl. f. Gewerbehyg., Sept., 1924, N. S. vol. 1, pp. 41–43.*

Koelsch has summarized the old classic on lead poisoning written by Stockhausen in 1656. As an historical contribution this is of great interest because of the present difficulty in finding the original book. The quotations from it in the literature vary markedly, so that a satisfactory, accurate résumé of the book is needed.—J. C. A.

SAMUEL STOCKHAUSEN'S TREATISE ON LEAD COLIC (1656) (CONTINUATION AND CONCLUSION). *Koelsch. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 76-77; Dec., 1924, pp. 101-103.*

In this historical document the question of the cause of the symptoms of lead colic is examined. The symptoms are traced back to the etiologic cause. By the process of elimination it is fixed on lead itself. The direct proof is given that lead is the cause, and then the method of entry into the body is determined—*i.e.*, that the

most probable means is through swallowing. Entry through the lungs is also considered a possibility.

The symptoms described by Stockhausen do not agree exactly with those known at the present time, neither are his pathogenesis and therapeusis entirely correct. These are, however, the mistakes of his time—mistakes which are still present in the literature of a much later date. As a whole, the paper is of great interest as well as of historical importance.—H. E. H.

ON THE WEAKNESS OF THE EXTENSORS OF THE HAND AS AN EARLY SYMPTOM OF LEAD POISONING, TOGETHER WITH A CONTRIBUTION TO THE PROPHYLAXIS OF INDUSTRIAL LEAD POISONING. *W. Hergt. Zentralbl. f. Gewerbehyg., Sept., 1924, N. S. vol. 1, pp. 37–39.*

Hergt has been unable to confirm Teleky's observation that one of the early signs of lead intoxication is a diminished ability to hyperextend the wrist.

General periodic medical examinations, with a study of the blood and urine, in plants with a lead hazard has been of distinct advantage in the reduction of lead intoxication.—J. C. A.

LEAD POISONING IN CERAMIC FACTORIES. *Heim et al. Abstr. as follows from Paris méd., Nov. 29, 1924, p. 447, in Jour. Am. Med. Assn., Jan. 10, 1925, vol. 84, p. 151.*

Heim, Agasse-LaFont, and Feil examined fifty-two workers in factories making tiles for chimney pieces and other glazed work. Those who manufactured the enamel (and were thus most exposed to lead poisoning) had been working at this trade for from twelve days to thirty-seven years, and none had lead colics. The characteristic lead line on the gums, however, was present in 50 per cent., while erythrocytes with basophilic stippling were found in 100 per cent. of these workers. In the other branches of the manufacture of ceramics the proportions were much less, but far from negligible.—K. R. D.

LEAD POISONING IN THE MANUFACTURE OF POTTERY. *E. Meyer. Zentralbl. f. Gewerbehyg., Dec., 1924, N. S. vol. 1, p. 97.*

In Hesse there has been an alarming increase in the number of cases of lead poisoning. In the smaller factories not PbO, litharge, but PbS, galena, was used in the process, because the latter has a lower melting point. Since 1917 instead of galena Pb_3O_4, minium or red lead, has been used. The latter has a higher specific gravity and also contains more lead. In addition it requires a higher temperature (950°C.) for smelting. When this high temperature is not reached, part of the minium remains unchanged, and it is this unchanged portion which is the cause of the lead poisoning.

Either minium must not be used, or the furnaces must be heated to a higher degree and be equipped with thermometers, or the pottery must be boiled out with some acid to dissolve the lead.—H. E. H.

THE HEALTH HAZARDS OF WORKERS IN THE AROMATIC NITRO COMPOUNDS (CONCLUSION). *Grott. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 80–82.*

Mortality in the trades which handle poisonous and nonpoisonous substances was higher in war time than it is now in peace. It is true that for certain diseases—*i.e.*, digestive and skin—the mortality is somewhat higher among the workers in aromatic compounds, although not notably so. Jaundice is not caused by handling trinitrotoluol but by certain impurities in the trinitrotoluol and therefore may be avoided.

It would be of advantage if laws were made calling for aerated, clean rooms; and requiring specially dangerous work to be done in separated rooms, and smelting to be done only under suction. No sickly people should be allowed to work, and dangerous positions should be reserved for men.

There ought to be medical inspection of the workers who should wear underwear, caps, shoes, and gloves while at work. Washstands should be provided where the laborers may wash their hands before meals and after work. Workers should be told to drink milk.—H. E. H.

DUST HAZARDS AND THEIR EFFECTS

CLEARING AIR OF DUST BY ELECTRIC MACHINES. *H. Fiesel. Zentralbl. f. Gewerbehyg., Dec., 1924, N. S. vol. 1, pp. 92–94.*

An apparatus is made by the American firm of Cottrell and Möller, and the European rights have been secured by a Frankfurt firm. Not only dust but bacteria and vapors are precipitated and sucked away. All exposed parts which are charged are grounded in order to prevent accidents.—H. E. H.

PNEUMONOKONIOSIS, PULMONARY TUBERCULOSIS, AND LUNG TUMORS. *G. Rodenacker-Wolfen. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 78–79.*

At present it is difficult to decide whether pulmonary tuberculosis ought to be considered a trade disease in the dusty occupations. In the Transvaal the English have so considered it, and if a worker becomes ill with tuberculosis before two years are over, he is indemnified.

Since medical inspection has been established, however, the morbidity rate has decreased partly because infected people are excluded and only strong people are given heavy work. Alternation of occupation is also necessary. In Europe pulmonary tuberculosis is a childhood disease and some immunity is established thereafter. On the other hand the negro workers are much more prone to this disease.

The author points out that silicosis may have a curative effect on tuberculosis because whereas tuberculosis is most prevalent among miners between the ages of 35 and 40, the mode of the curve for the nonmining laborers is between the ages of 30 and 35. He thinks that with medical inspection pulmonary tuberculosis will be removed from the list of industrial diseases in the dusty industries. On the other hand, because of the irritat-

ing effect of dust and the later time of appearance of tuberculosis in these cases, lung tumors will increase in numbers.—H. E. H.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Occupational Hazards of Radiologist. *R. D. Carman and A. Miller. Abstr. as follows from Radiology, Nov., 1924, vol. 3, p. 408, in Jour. Am. Med. Assn., Jan. 3, 1925, vol. 84, p. 66.*

Carman and Miller are convinced that many radiologists are being harmed in their daily work and are menaced by graver injuries. To avert these injuries it is necessary, first of all, that the radiologic worker be impressed so thoroughly with his danger that he will take adequate precautions. Either the methods of protection now in common use are not effective, or the worker is careless in their application. The worker should be shielded not only from direct rays, but also from secondary irradiation which may reach him from any angle. For the radiographer, efficient protection can be secured by simple means, but in fluoroscopy and radiotherapy more elaborate measures are required. Protection from irradiation and prevention of electric shocks have been given more attention of late by the manufacturers of roentgen-ray apparatus. Even with all practicable safeguards, a certain degree of exposure cannot be evaded. Laboratories doing a large amount of work should, therefore, have a reserve personnel to permit alternation of service or frequent holidays. Workers should repeatedly be cautioned to receive the least possible amount of irradiation consistent with the performance of their duty. Modern life, regardless of occupation, has an abundance of risks, and additions are superfluous. Besides taking all reasonable precautions, workers should have frequent medical examination.—K. R. D.

Ocular Defects Arising from Skull Injuries. *J. S. Somberg. N. Y. State Dept. Labor, Bur. Workmen's Compensation, Med. Div. Bull. No. 10, 1924, pp. 49.*

1. Any structure of the eye or its musculature or the optic pathways may be involved in skull injuries.

2. Fractures of the skull are not necessary for such involvement.

3. The severity of the concussion is not always the determining factor in the amount of intracerebral or ocular damage.

4. Functional conditions are very apt to result from a very slight skull injury, without any concussion of the brain.

5. Ocular conditions resulting from skull injuries are often overlooked due to various factors.

6. Functional ocular involvement usually subsides within a definite period, but if it persists, malingering should be suspected.

7. Ophthalmologic examination is indicated in all skull injuries, no matter how apparently trivial they may be.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

THE HEALTH AND ACCIDENT HAZARDS OF THE SHIPBUILDING INDUSTRY AND THEIR PREVENTION. *Barkow. Zentralbl. f. Gewerbehyg., Dec., 1924, N. S. vol. 1, pp. 89–91.*

In addition to the dangers usually associated with building there are others peculiar to shipbuilding. These the author classifies under six headings: (1) the transport of heavy parts; (2) work on scaffolding; (3) work in the open; (4) work with accessory apparatus; (5) work in uncomfortable and narrow places; and (6) work over the water.—H. E. H.

STATIC ELECTRICITY AS A CAUSE OF FIRES AND EXPLOSIONS (CONCLUSION). *Wolter. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 86–87.*

Professor Nusselt found that the reason for the explosion which occurs so often in connection with hydrogen gas used for balloons lies in the fact that the hydrogen gas becomes charged as it escapes out of a comparatively small opening, and if it happens to be mixed with dust, an explosion or fire results. A copper wire put at the stopcock will discharge the electricity and prevent accidents.

Though most explosions in mills, granaries, mines, etc., are started by external heat, it is also possible that the particles may acquire an electric charge which may start the conflagration. There are also other possibilities of accidents which should be guarded against.—H. E. H.

EXAMINATION FOR LICENSE TO TRANSPORT, STORE, AND USE EXPLOSIVES. *Krüger. Zentralbl. f. Gewerbehyg., Dec., 1924, N. S. vol. 1, pp. 94–96.*

Prussian law requires people handling explosives to have sufficient knowledge to do so and to display a placard to that effect. The examination for the license should be practical rather than theoretical—that is, the applicant should actually perform the various operations to the satisfaction of the examiner.

The questions to be put may be classified under five headings: (1) handling of explosives and dangers thereof; (2) transport and storing; (3) methods of ignition and loading; (4) handling of missed explosions; and (5) protection of neighborhood and workers.—H. E. H.

AUTOMATIC COUPLINGS AND THE SAFETY OF RAILWAY WORKERS. *Internat. Labour Office, Studies and Reports, Series F Second Section (Safety) No. 1. Geneva, 1924, pp. 62.*

An attempt is made to estimate and compare the risk of coupling and uncoupling accidents and the occupational risk of shunting operators in the several countries of America and Europe. The actual effects of automatic couplings when introduced have been most beneficial to railwaymen. Fatal and nonfatal accidents have been reduced about 20 per cent. in the United States by the introduction of automatic couplings. With regard to countries where couplings are nonautomatic, the degree of accident risk and of accident frequency, as expressed by the proportion of coupling and uncoupling accidents in relation

to total accidents and to the total number of kilometers run, appears to be considerably lower in the United Kingdom than in the United States since the introduction of automatic couplings. In most of the countries of continental Europe, however, the risk in coupling and uncoupling accidents expressed by the corresponding percentages is higher than in either the United Kingdom or the United States. Average fatalities from these accidents in most countries is 1.5 to 2.5 per thousand shunting operators, and 50 to 60 per thousand injured, with about 10 of these severely injured. A rough estimate shows that the average number of both fatal and nonfatal accidents is much higher for the nonautomatic system than for the automatic system of coupling and uncoupling.

Thirteen tables giving statistics of accidents to railway employees and particularly of accidents due to coupling and uncoupling operations are appended, covering fifteen different countries over a period of years varying from 1893 to 1920.—B. L. G.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

PHYSIOLOGY OF WORK. *E. Atzler. Deutsch. med. Wchnschr., Sept. 19, 1924, vol. 50, pp. 1280–1282; Sept. 26, 1924, pp. 1320–1323.*

THE EFFECTS OF POSTURE AND REST IN MUSCULAR WORK. *E. M. Bedale and H. M. Vernon. Indust. Fatigue Res. Board, Rep. No. 29. H. M. Stationery Office, 1924, pp. 55.*

In Part A of this report Miss Bedale describes numerous series of observations of the energy expenditure of a woman carrying loads in various positions. The load carried varied from 20 to 60 pounds, and the subject walked for an hour at a steady pace (2.8 miles an hour). She carried the load and an "empty" for 100 yards' distance alternately, and after twenty, forty, and fifty-seven minutes' work samples of expired air were collected in a Douglas bag, for measurement and analysis, over a two and one-half minute period (*i.e.*, the time taken over the double journey). In mode (1) the weight was carried on a tray in front of the body by means of the arms. In (2) it was carried in the same position, but the weight was taken off the arms by a strap passed round the shoulders. In (3) it was tied up in equal bundles, and carried at the sides in either hand. In (4) it was distributed over a board carried on the left shoulder. In (5) it was carried on a tray on the left hip. In (6) it was carried in a rucksack. In (7) it was divided between two pails and carried on a shoulder yoke, and in (8) it was carried in a tray upon the head. The clearest picture of the relative physical effort required is obtained from the oxygen consumption per minute, after deduction of the average consumption of the subject lying down at rest. This method showed that the carriage, *e.g.*, of a 20-pound load varied between the extremes of 400 c.c. of oxygen consumed for mode (7) (yoke), and 574 c.c. for mode (5) (hip); while modes (4), (3), (1), (2), (8), and (6) showed costs of 428,

455, 464, 473, 527, and 561 c.c. of oxygen, respectively. When reckoned in terms of oxygen per kilogram of load per meter carried, the cost was found to increase gradually the heavier the load. In the yoke mode the cost rose at a decreasing rate, and with loads of 20, 30, 40, and 50 pounds it was 0.082, 0.089, 0.094, and 0.097 c.c., respectively. In most of the modes it rose at a steady rate up to 40 pounds, and then rose rather more rapidly, but in mode (3) (bundles) it increased throughout (*viz.*, 0.099, 0.101, 0.110, and 0.137 c.c. for the respective loads), owing to the severe strain felt in the arms. The different effects are due to the interaction of the factors of local strain, posture, gait, and chest freedom, and it is considered that the efficiency point of the subject concerned for most of the modes of carrying was 40 pounds, or 35 per cent. of her body weight.

In Part B of the report Dr. H. M. Vernon describes an investigation on "The Influence of Rest Pauses and Changes of Posture on the Capacity for Muscular Work." To test work capacity, he used a spring balance (registering to 500 pounds) fixed horizontally at floor level, to which was attached a handle and chain working round a pulley. A lever, connected with the apparatus, wrote on a smoked drum and gave accurate records of the strength of pull. The dynamometer tested chiefly the strength of the back and arm muscles, rather than the leg muscles, for it was found that the strength of pull was only 2 per cent. less when the subject stood on one leg than when he stood on both legs; but when he used one hand instead of two, it fell to 52 per cent. of its value. On testing the strength of pull when the handle of the dynamometer was fixed at various heights above floor level, it was found that there is a "weak spot" in the pull, or weight-lifting power. Taking the strength of pull at floor level as 100, it sank (in two subjects) to a minimum value of 72 to 81 at a height of 14 to 17 inches above the floor, and then increased till it attained a maximum of 107 to 142 at a height of 28 inches above the floor. At greater heights it fell rapidly.

When the dynamometer was pulled at regular intervals, synchronous with the ticks of a metronome, the strength of pull fell rapidly for the first four minutes, and then for a long time kept at a nearly steady level. The height of this level varied with the frequency of the rhythm, being 53 per cent. on the initial height when pulls were made every one and one-half seconds, and 85 per cent. on it when made every four seconds.

In most of the experiments on rest pauses, the duration of the rest periods was to that of the work periods as 1 to 4, or as 2 to 3. Rest pauses of the same relative duration to the work periods were taken at intervals of two and one-half seconds, ten seconds, forty seconds, two minutes, and five minutes. It was found that the capacity for work was very little affected by the length of the interval. If the subject of the experiment remained motionless during the rest period, the total work done was always less (sometimes 28 per cent. less) than when no rests whatever were taken; but if the subject gently bent his shoulders back and moved his arms about, these changes of posture caused

a tremendous reduction in the fatigue effect. The total work done was 2 to 14 per cent. greater than when no rests were taken, and the strength of pull remained at a constant level for as long as the experiment was continued (*e.g.*, eighty-eight minutes). When no changes of posture were made during the rests, the strength of pull continued to fall for most if not all of the experiment.

The posture effect is probably due chiefly to the influence of the postural changes on the circulation, as was suggested by the following experiments. (1) It was found that if the strength of pull was determined (*a*) when standing; (*b*) when sitting; and (*c*) when alternately standing and sitting; the average strength of pull in (*c*) was 6 to 15 per cent. greater than the average of (*a*) and (*b*). Presumably the alternate standing and sitting movements, being of a somewhat different character, promoted the circulation. (2) If an occasional pull was made during the rest pauses of a "posture-unchanged" experiment, the fatigue effect was considerably diminished in spite of the extra work done, as each pull of itself promoted the circulation. (3) If the shoulders were bent back about $2\frac{1}{2}$ inches during each individual pull, instead of being kept immovable, the fatigue effect was greatly diminished, and the strength of pull was almost as great when no postural changes were made during the rest pauses as it was when the changes were made. (4) If a hot bath was taken twenty minutes before an experiment, the fatigue effect was very much more pronounced, presumably because some of the usual blood supply was diverted from the muscles to the skin.

The observations indicate that when a rest pause is taken in the course of industrial work, it is important that the posture should be changed, even if the pause lasts only a minute. Operatives standing at their work should sit down, and those sitting down should stand up and if possible walk about. Again, when the industrial process can be carried out equally well in the standing and the sitting position, the workers should get into the habit of making the postural changes frequently during work. The observations suggest that the swaying movements made by some operatives when at work may, in some cases, improve the circulation and diminish fatigue.

The pulse showed no greater acceleration in the experiments when the posture was changed during rest pauses than when it was not changed, in spite of the fact that 30 per cent. more work was being done.—H. M. V.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

REPORT OF THE COMMITTEE ON PHYSICAL STANDARDS FOR DRIVERS OF MOTOR VEHICLES. *Jour. Am. Med. Assn., Dec. 27, 1924, vol. 83, pp. 2094–2095.*

The physical requirements deemed advisable by this Committee are as follows:

1. Every individual driving a motor vehicle, private, public or commercial, of

the self-propelled type (automotive) shall be required to present to the motor licensing board in each state a certificate from a reputable physician (the standard of such medical fitness shall be licensure to practice medicine or surgery) in which the following points are certified:

(*a*) The applicant has no disqualifying defects of either legs or arms (anatomic or functional loss of hand, arm, foot or leg).

(*b*) The applicant has vision of at least 20/50 in one eye and vision of at least 20/100 in the other eye, with or without glasses.

(*c*) Double vision shall disqualify.

(*d*) All candidates must be able to hear a low spoken voice at 5 feet.

(*e*) The mentality of the applicant must be adequate and the heart's action reasonably healthy.

The report contains also recommendations in regard to licenses and their renewal, and to the establishment of special or county boards of physical licensure.—K. R. D.

INDUSTRIAL NURSING

THE INDUSTRIAL NURSE AS INTERPRETER. *M. Elderkin. Pub. Health Nurse, Dec., 1924, vol. 16, pp. 642–644.*

Whether in a factory there is need for a nurse, or whether some large company has a well-organized medical force, the duty of the industrial nurse is always to act as interpreter for the employer, the doctor, the employee, and the many agencies interested in both the employer and the employee. The duty may be to interpret to the employee the "boss's" reason for his attempts to safeguard his employees, or to interpret the doctor's advice to the patient, or to interpret to the employer the worker's attitude toward health measures. Health is subdivided into the mental, the moral, and the physical, and it is by living, practising, and interpreting all three that an industrial nurse may do the greatest service.—B. L. G.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

EFFICIENCY TESTS OF PENNSYLVANIA RAILROAD PERSONNEL. *C. M. Sheaffer. Jour. Personnel Res., Nov., 1924, vol. 3, pp. 244–251.*

"Wherever large numbers of men and women are employed, it is necessary for the management to check up periodically to see how well all regulations are being observed. In the railroad industry such a check is imperative, as many lives depend on the strict observance of all safety precautions by those concerned with train movement. About twenty years ago the Pennsylvania Railroad introduced a system of efficiency tests designed to furnish accurate information on the observance of safety rules. This system gradually developed, and in 1910 a uniform practice was adopted on all the Pennsylvania Lines east of Pittsburgh and Erie. Certain revisions have been made from time to time, and in February, 1923, a special committee was appointed to review all details in connection with efficiency

tests and observations on the entire Pennsylvania Railroad System. The practice as outlined by the committee was adopted as standard for the System in May, 1923." Mr. Sheaffer, who is chief of transportation, summarizes what this practice is and how it operates in the following words:

1. The management knows with reasonable certainty whether the safeguards which it has built around its service are being actually observed by the employees responsible for their observance. Under conditions governing railroad operation, no other practical means of determining this systematically and continuously has been devised.

2. The plan encourages employees to strict observance of safe operation by building up for the individual a permanent record of efficient performance under all sorts of operating conditions.

3. The public is assured of a greater degree of care for its safety than would otherwise be possible.

—H. B. E.

REHABILITATION OF DISABLED EMPLOYEES

ARTIFICIAL LIMBS: APPLIANCES FOR THE DISABLED. *F. Martin. Internat. Labour Office, Studies and Reports, Series E (Disabled Men) No. 5. Geneva, 1924, pp. 303.*

The object of this report is the general dissemination of information and it is therefore not purely scientific in character. It is intended to present information to all those who for any reason are interested in artificial appliances: disabled soldiers or sailors, persons injured in industrial accidents, institutions for insurance against accidents, invalidity, sickness, etc.

After summarizing the general principles on which surgical and orthopedic treatment of amputations should be based, the author reviews the appliances at present in use, classifying them according to the type of amputation and the method of artificial limb manufacture. A brief description is given of each limb mentioned, accompanied by a sketch or a photograph. The author constantly emphasizes the fact that artificial limb fitting is an important means of restoring the vocational capacity of disabled men, especially those disabled in industry.

Considerations advanced by wearers regarding different artificial limbs are entirely general. The individual factor is most important: one man fitted with an appliance is remarkably efficient, while another is unable to accustom himself to the prosthesis. Therapeutic and vocational training is a valuable adjunct, and one which every limb-maker should be able to utilize. There is still much room for improvement in upper limb prosthesis, which may eventually be overcome by scientific research. Co-operation between the surgeon, the orthopedist, and the limb-maker could accomplish much in restoring to upper limb amputees a large proportion of the prehensile power lost through mutilation. It is unfortunate that hospital organization is ill adapted for such co-operation.—B. L. G.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

ADMINISTRATION OF LABOUR LAWS IN BRITISH COLUMBIA IN 1923. *Internat. Labour Rev., Feb., 1925, vol. 11, pp. 250–251.*

The hours of work in British Columbia appear to conform to the Washington Convention of a forty-eight-hour week. The report deals mainly with statistical returns of the number, age, sex, and nationality of workers, and with illegal practices with regard to payments. Labor disputes are also reported on, but the question of hygiene is not considered.—E. L. C.

ADMINISTRATION OF LABOUR LAWS IN ONTARIO IN 1922 AND 1923. *Internat. Labour Rev., Feb., 1925, vol. 11, pp. 248–250.*

Much of this report is devoted to employment exchange work and to wages and hours. Apparently rather long hours are worked, as in 1923 over 10 per cent. of the workers were employed fifty-eight to sixty hours a week. The occurrence of accidents and their prevention receive considerable notice. The report also includes an article on factory hygiene in Ontario.—E. L. C.

INDUSTRIAL INSPECTION IN SWEDEN IN 1923. *Internat. Labour Rev., Feb., 1925, vol. 11, pp. 244–248.*

Inspection was carried out in the usual manner by a permanent staff. The report deals mainly with accident prevention and safety questions. A considerable amount of space is allocated to general ventilation and to dust removal. Descriptions are also given of lavatory, cloakroom and rest room accommodation. Cases of poisoning due to the inhalation of sulphuretted hydrogen are reported. The work of medical examination of young persons is described, together with a recommendation made by one certifying surgeon that provision for a midday meal should be made a condition of employment when young persons are far from home whence they often start without a proper breakfast. First-aid dressings at the workplaces are required for lumbermen, for whom first-aid classes were organized with the help of the Red Cross.—E. L. C.

FACTORY INSPECTION IN NORWAY IN 1923. *Internat. Labour Rev., March, 1925, vol. 11, pp. 397–400.*

This report on the work of the inspectorial staff deals mainly with statistics, contravention of Acts, and hours of work. In this country as elsewhere general depression hindered improvement of hygiene and safety conditions. Skin disorders were noted in herring curers' undertakings, and among workers handling salted fish, due apparently to exposure to rock salt; thorough washing and greasing of the hands is the precaution recommended.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

THE HAZARDS DUE TO THE EXHAUST FROM GASOLINE MOTORS. *E. Ciampolini. N. Y. State Dept. Labor, Div. Indust. Hyg., 1924, pp. 15.*

Compare THIS JOURNAL, 1924, vol. 6, p. 102.

CHRONIC CARBON MONOXID POISONING. *H. B. Beck and W. Fort. Abstr. as follows from Ann. Clin. Med., Dec., 1924, vol. 3, p. 437, in Jour. Am. Med. Assn., March 7, 1925, vol. 84, p. 779.*

Beck and Fort caution not to make a diagnosis of chronic carbon monoxide poisoning without a history of exposure to gases containing carbon monoxide. An interesting and noteworthy feature in many of the patients is a pallor resembling a high grade of anemia, as well as a group of symptoms suggestive of anemia, in the presence of a red cell count of more than 5,000,000. This condition, which was present in several of the authors' patients, is of considerable diagnostic significance; and, in the opinion of several authorities, is almost pathognomonic. As there is no specific antidote for chronic carbon monoxide poisoning, treatment must necessarily be symptomatic.—K. R. D.

SO-CALLED MYOSITIS AFTER ILLUMINATING GAS POISONING. *A. Braun. Abstr. as follows from München. med.*

Wchnschr., Jan. 2, 1925, vol. 72, p. 13, in Jour. Am. Med. Assn., Feb. 21, 1925, vol. 84, p. 634.

Braun attributes the affections of skin and muscles after carbon monoxide poisoning to muscular hemorrhages. They are probably due to ruptures of blood vessels by the increased arterial pressure when breathing of air is resumed, or in violent movements.—K. R. D.

AN UNUSUAL CORTICAL CHANGE IN CO POISONING. *G. Wilson and N. W. Winkelman. Arch. Neurol. and Psych., Feb., 1925, vol. 13, p. 191.*

This is a brief report of a case of illuminating gas poisoning. The man died after seventeen days of unconsciousness. Histologic changes in the cerebral cortex are described. In the third and fourth cortical layers many ganglion cells were found undergoing destruction; others appeared normal. The smaller vessels and the glia-cells were proliferating. In the basal ganglia slight involvement was found, but not the softening usually described. The authors think that the distribution of the lesions is not to be explained by the character of the blood supply and they offer no explanation of the distribution. No distinction is made in the discussion of this case between poisoning by carbon monoxide and poisoning by illuminating gas.—H. S. F.

ELIMINATION OF CARBON MONOXIDE. *M. Nicloux et al. Abstr. as follows from Compt. rend. Soc. de biol., Jan. 30, 1925, vol. 92, p. 178, in Jour. Am. Med. Assn., March 14, 1925, vol. 84, p. 857.*

Of two dogs intoxicated with carbon monoxide, one was given air for inhalation, while the other was treated simultaneously with subcutaneous injections of oxygen. The elimination of the carbon monoxide was more rapid in the second dog. In a second pair, the elimination of carbon monoxide was more rapid in the dog that had inhaled oxygen than in the one which had inhaled air and had been given subcutaneous injections of oxygen. Inhalation of pure oxygen seemed to be much superior to either method in treatment of grave carbon monoxide poisoning. The experiments failed to confirm Henderson and Haggard's statement that inhalation of air combined with 5 per cent. of carbon dioxide is more effective than inhalation of pure oxygen for hastening elimination of carbon monoxide.—K. R. D.

THE USE OF CARBON DIOXIDE AS A REMEDY FOR GAS-POISONING. *J. S. Haldane. Tr. Inst. Min. Eng., Jan., 1925, vol. 68, pp. 271–278.*

In this paper Dr. Haldane speaks of the difficulty of treating cases of gas poisoning with the carbon-dioxide-oxygen mixture, on account of the great bulk of the apparatus required. He suggests the use of carbon dioxide and air and has devised a small portable apparatus consisting of a cylinder containing 2 pounds of liquid carbon dioxide. The cylinder is fitted with a reducing valve which can be adjusted so as to deliver 1.5 liters of carbon dioxide a minute. The nozzle is fitted to an injector apparatus and tube so devised that the gas carries with it through the tube at least twenty times its volume of air, thus producing a current of 30 liters of air

a minute containing 5 per cent. of carbon dioxide gas. The mixture is delivered into a small flexible bag through a wide tube to a facepiece fitted with inspiratory and expiratory valves. The cylinder will last for five hours and the apparatus can be easily carried about. A cylinder of the same size filled with a 5 per cent. mixture of carbon dioxide with oxygen would be used up in five minutes. Dr. Haldane warns against the danger of forcible artificial respiration which may be followed by a condition of stupefaction. Mechanical means for increasing artificial respiration are not desirable, and gentle, slow artificial respiration by Schäfer's method is all that is required.—T. L. L.

Relation of Chronic Poisoning with Copper to Hemochromatosis. *F. B. Mallory. Abstr. as follows from Am. Jour. Pathol., Jan., 1925, vol. 1, p. 117, in Jour. Am. Med. Assn., March 21, 1925, vol. 84, pp. 919–920.*

Evidence is steadily accumulating to prove that chronic poisoning with copper is the cause of hemochromatosis. Mallory reports on ten cases that came to necropsy. While the fully developed disease is relatively rare, the early stages and the lighter forms are fairly common, but are necessarily unrecognized by the clinician and commonly overlooked by the pathologist. The sources of the poisoning are: (1) distilled liquors contaminated with copper dissolved from the copper worm of the condenser by the action of volatile organic acids (citric, acetic, etc.); (2) occupations involving exposure to copper dust (brass foundries, brass milling, planing and polishing, telephone line repairing) as the metal is readily dissolved in the juices of the body, however it may obtain entrance; and (3) probably also acid foods, jellies, candies, etc., contaminated by copper owing to having been cooked in copper vessels. Under this last heading must be included foods cooked and dried in copper kettles and pans, owing to the dissolving action of oleic, palmitic, and stearic acids in lard and other fats on the metal. Experimental work with animals demonstrates that copper inhaled or ingested is dangerous to life, although its action as a chronic poison is exceedingly slow. This is the reason its deleterious effect has been so long overlooked. Studies of clinical cases show that ordinarily it takes from fifteen to twenty-five or more years to produce the symptom-complex of the disease known as hemochromatosis.

Mallory urges that steps should be taken to prevent copper getting into liquors and foods and to protect workers in occupations involving copper from inhaling or ingesting copper dust. The reason that copper is generally found in minute quantities in human organs is not due to its being a normal constituent of the tissues but because man is constantly exposed to taking the metal into his system through foods and drinks contaminated with it. While small amounts cause no harm, because slowly eliminated, larger amounts absorbed during many years are exceedingly dangerous. Susceptibility to poisoning by copper probably plays a part as is the case with lead and arsenic.—K. R. D.

TETRA-ETHYL LEAD AND THE PUBLIC HEALTH. *J. H. Schrader. Am. Jour. Pub. Health, March, 1925, vol. 15, pp. 213–216.*

This paper consists mainly in a review of the recent report from the United States Bureau of Mines. (See also THIS JOUR., 1925, vol. 7, pp. 94-96.)—P. D.

DUST HAZARDS AND THEIR EFFECTS

THE A-A DUST DETERMINATOR. *M. Ingels. Jour. Am. Soc. Heating and Ventil. Eng., Jan., 1925, vol. 31, pp. 5–21.*

This paper describes new methods of utilizing the Anderson-Armspach Dust Determinator with detailed charts and tables and discussions of various filtering media. As was pointed out in a previous abstract in THIS JOURNAL (see 1923–1924, vol. 5, p. 54), the method is based on measuring changes in resistance across a filtering medium. The various factors affecting this increase in resistance as dust particles are caught by the filter, the accuracy attainable by the method, and the length of time at which the apparatus should be run to make results reliable are pointed out.—P. D.

STUDIES ON THE INDUSTRIAL DUST PROBLEM. I. DUST INHALATION AND ITS RELATION TO INDUSTRIAL TUBERCULOSIS. *L. Greenburg. U. S. Pub. Health Rep., Feb. 13, 1925, vol. 40, pp. 291–309.*

The experimental, clinical, and statistical literature on the relation of dust, silica in particular, to tuberculosis, is discussed with numerous references and a well-prepared bibliography. The author concludes: "It would appear that the injurious effects of the inhalation of a particular harmful dust are proportional to the amount of dust breathed, this resolving itself into the important consideration of the duration of trade life and the quantity of dust suspended in the atmosphere."—P. D.

REVIEW OF COAL-DUST INVESTIGATIONS. *G. S. Rice. Presented at the Symposium on Prevention of Coal Dust Explosions of the Am. Inst. Min. and Met. Eng. in New York City, Feb., 1925, pp. 32.*

This is a thorough discussion of the United States Bureau of Mines' experimental work in rock dusting (shale) and the use of rock dust barriers in reducing and stopping bituminous coal dust explosions.—P. D.

ARE HUMIDIFYING METHODS A FAILURE IN EXPLOSION PREVENTION IN COAL MINES? *D. Harrington. Presented at the Symposium on Prevention of Coal Dust Explosions of the Am. Inst. Min. and Met. Eng. in New York City, Feb., 1925, pp. 11 (mimeographed).*

This is a discussion of the advantages of sprinkling and humidification in reducing explosions in bituminous coal mines. Many examples of explosions stopped in watered areas are given. In his conclusion the author states: "It appears that both

sprinkling and rock dusting should be done in every coal mine—the sprinkling largely at or around the face, the rock dusting in the entries and particularly those on intake air, and both methods should cover ribs, roof, floor and timbers. Both methods must be kept in condition, and to do this *constant* and continuous supervision must be exercised and much rock dusting as well as sprinkling work must be done continually."—P. D.

RECOMMENDED STANDARD PRACTICES FOR ROCK DUSTING COAL MINES TO PREVENT COAL DUST EXPLOSIONS. *E. A. Holbrook. Presented at the Symposium on Prevention of Coal Dust Explosions of the Am. Inst. Min. and Met. Eng. in New York City, Feb., 1925, pp. 3 (mimeographed).*

These practices include definitions of mines requiring dusting, kind, size, and amount of dust to be used, parts of mines to be dusted, the sampling of dust for analysis, and taking records of places sampled.—P. D.

COTTON DUST AND THE LUNGS. *K. Schilling. Abstr. as follows from Deutsch. Arch. f. klin. Med., Feb., 1925, vol. 146, p. 163, in Jour. Am. Med. Assn., April 4, 1925, vol. 84, p. 1089.*

Schilling found no distinct pneumonokoniotic changes in workers in cotton mills. The only changes were an increased predisposition to bronchitis and emphysema. The tuberculosis rate was not above the average.—K. R. D.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

THREE CASES OF ANTHRAX SEPTICEMIA. *Jagnov. Abstr. as follows from Presse méd., Dec. 6, 1924, vol. 32, p. 970, in Jour. Am. Med. Assn., Jan. 17, 1925, vol. 84, p. 236.*

Jagnov's necropsy findings in three cases of anthrax septicemia showed anthrax lesions in almost all the viscera. The liver was the only organ which presented no macroscopic nor microscopic changes. This fact tends to confirm Roger's conclusion that the liver withholds and destroys the anthrax bacilli. No trace of inflammation was manifest in the viscera, contrary to what occurs in experimental anthrax. Grave nutritive disturbances, focal or diffuse necrosis were noted in the organs, where the vessels were obstructed with the bacilli.—K. R. D.

ANTHRAX MENINGO-ENCEPHALITIS. *J. R. Paso and A. Barni. Abstr. as follows from Semana méd., Jan. 22, 1925, vol. 1, p. 173, in Jour. Am. Med. Assn., March 21, 1925, vol. 84, p. 927.*

Paso and Barni give an illustrated description of the case of a man, aged 58, with an anthrax pustule above his left eyebrow. The fifth day symptoms developed showing involvement of brain and meninges, fatal in thirty hours. They summarize from the records about thirty-one cases with similar metastatic meningitis or en-

cephalitis or both, four published in South America.—K. R. D.

VACCINATION AGAINST ANTHRAX. *T. Monod and H. Velu. Abstr. as follows from Compt. rend. Soc. de biol., Feb. 6, 1925, vol. 92, p. 251, in Jour. Am. Med. Assn., April 4, 1925, vol. 84, pp. 1085–1086.*

Monod and Velu conclude from the experiences on 21,640 cattle, sheep, pigs, and horses in Morocco that the single intradermal vaccination against anthrax is at least as effectual as the subcutaneous injection. It proved harmless in already contaminated herds. Considering the rapid development of the refractory phase, the vaccine can be administered without a preliminary injection of serum.—K. R. D.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

OCCUPATIONAL ECZEMA. *B. Bloch. Abstr. as follows from Schweiz. med. Wchnschr., Jan. 29, 1925, vol. 55, p. 89, in Jour. Am. Med. Assn., March 21, 1925, vol. 84, p. 926.*

Bloch emphasizes the fact that occupational eczema is a manifestation of an idiosyncrasy, an extra susceptibility of the skin, and a constitutional predisposition. The eczema reaction occurs more readily with turpentine, quinine, formaldehyde, etc. Contact with one of these—not endogenous eczema-producing substances—is generally responsible for the affection.—K. R. D.

JUTE DERMATITIS. *D. F. Curjel and H. W. Acton. Abstr. as follows from Indian Jour. Med. Res., Oct., 1924, vol. 12, p. 257, in Jour. Am. Med. Assn., April 4, 1925, vol. 84, p. 1081.*

Jute dermatitis is described by Curjel and Acton as a nonsuppurative folliculitis caused by the mechanical blocking of the sebaceous gland orifices by plugs of the unexfoliated stratum. The mineral oil used for softening the jute does not irritate the skin, but protects the skin from water and so increases the accumulation of the corneum. The disease has escaped adequate description as a trade dermatitis among workers in the tropics, for the eruptions are not associated with subjective symptoms, and occur in a class of patients who are indifferent to their personal appearances.—K. R. D.

LIME DERMATITIS. *W. J. O'Donovan. Lancet, March 21, 1925, vol. 1, pp. 599–602.*

In this suggestive paper, attention is drawn to a series of cases of occupational dermatosis in which the connection between the work and the skin trouble has been previously missed. All except one were employees in underground tunneling, with or without the aid of compressed-air shields. The five men affected appear to have come in contact with the lime during the process of "grouting." This consists of taking the dry lime, slaking it with water and placing it between the iron shields and the brickwork of the tunnel under construction. The

sixth case, in a housewife, was due to the chloride of lime used in her washing.

O'Donovan draws the following conclusions: Dermatitis due to lime may arise in a variety of industries in which the label, or name of the work, does not disclose the risk. The types of eruptions caused by lime are very varied and may be superficial or deep. Perforation of the septum is sometimes seen. Oversweating or an abnormally dry skin predispose a skin to this trouble.—R. P. W.

TWO CASES OF ACARUS DISEASE IN DATE PACKERS. *M. Oppenheim and H. Taglicht. Wien. med. Wchnschr., Feb. 7, 1925, vol. 75, pp. 363–368.*

The first reported attack, by the Tyroglyphus family of acari on workers among dried dates is described by Oppenheim and Taglicht. Six women were engaged in sorting some of this damaged fruit and most of them, on the uncovered parts of the skin, suffered from the usual highly pruriginous eruption. Two of the cases are fully depicted.—R. P. W.

MYCOTIC PARONYCHIA AND DERMATITIS. A HITHERTO UNDESCRIBED CONDITION APPARENTLY PECULIAR TO FRUIT CANNERS. *L. B. Kingery and C. H. Thienes. Arch. Dermat. and Syph., Feb., 1925, vol. 11, pp. 186–202.*

The authors conclude their paper as follows:

1. An occupational dermatosis, commonly known as "fruit poisoning," has existed in certain sections of the Northwest for a number of years.

2. Cultures from several patients have uniformly revealed pure cultures of a yeast-like organism.

3. Animal and human inoculations with organisms thus obtained result in a clinical picture practically identical with known mycelial infections of the skin and exactly corresponding to the symptoms of patients suffering from the disease.

4. In spite of the known ubiquity of various forms of yeasts, especially in the presence of food sugars, it would seem that so-called "fruit poisoning" may be properly classified with the now known dermatomycoses.

5. A discussion of the suggestive association of the disease with the handling of certain fruits, the proper generic classification of the causative organism and the therapeutic management of the infection must await the result of studies now in progress.

REPORT ON BAKERS' DERMATITIS. *A. C. Parsons. Abstr. as follows from Brit. Jour. Dermat. and Syph., 1924, vol. 36, p. 193, in Arch. Dermat. and Syph., March, 1925, vol. 11, p. 380.*

Parsons reviews the subject of bakers' dermatitis and finds that manual contact with dough is a fundamental factor in its etiology. Personal habits and personal predisposition also play a part. Inferiority and adulteration of war flour may have been incidental factors, but there is no proof that the refining processes used at present by flour millers have any particular connection with dermatitis among bakers. The handling of sugars, salt, cream powders, and acid phosphate of lime, are other factors which may play a part.

He concluded that it seems probable that the majority of true cases of bakers' dermatitis are caused by the chronic irritation of dough. In pro-

phylaxis the use of machine, rather than hand mixing of dough, improved toilet facilities, and the thorough cleansing and drying of the arms after the operation of dough mixing are all important.

PAINFUL OCCUPATIONAL HYPERKERATOSIS OF THE NAILS. *Spillmann and Mougolle. Bull. Soc. franç. de dermat. et syph., Jan., 1925, pp. 49–50.*

Marked thickenings of the undersurfaces of the nails of the thumbs, indices, and middle fingers in an oculist are described by these writers. Yellowish masses raised each nail from its bed. Owing to the accompanying extreme tenderness the medical man was unable to continue his work. The disuse of novocaine led to a rapid disappearance of all pain in eight days. Gradually the nails resumed their normal shape and consistence. A practically similar condition was found in a dentist and its cause traced to the same drug.

Excessive hypertrophy with fraying and cracking (*fendillement*) on the claw-like edges of the nails is reported in a worker in a salt mine. The lesions are attributed by these writers to contact with naphthalene.

This chemical has not previously been reputed to possess this action. To the extractor the more probable agent would seem to be the salt.—R. P. W.

CHRONIC ROENTGEN-RAY DERMATOSES AS SEEN IN THE PROFESSIONAL MAN. *H. N. Cole. Jour. Am. Med. Assn., March 21, 1925, vol. 84, pp. 865–873.*

The author sums up his paper as follows:

1. It is my impression that roentgen-ray dermatoses in physicians and technicians are far more numerous than the literature would lead us to believe. Many cases, even severe ones, have probably never been reported.

2. In six of the cases reported, a clinical diagnosis of malignant degeneration was made, and was confirmed microscopically in three, these three being the only patients allowing microscopic examination. . . . .

3. A microscopic study of tissues from selected roentgen-ray dermatoses shows that it is a degenerative change resulting from sclerosis of the vessels supplying the skin: the glandular elements of the corium disappear; the corium is much thickened from the formation of a degenerated hyaline, collagenous-like material; new-formed capillaries (telangiectases) attempt to replace the lost blood supply of the corium. In early stages, the epidermis is not much affected; but in older cases, the epidermis proliferates in its hunt for nourishment from the corium and sends down epidermal processes, which finally grow wild and take on a malignant change.

4. The treatment of chronic roentgen-ray and radium dermatoses consists in the use of quartz lamp therapy, carbon dioxide snow, electrocoagulation, surgery, and in some cases radium and roentgen-ray treatment. It is quite successful if not too much damage has been done and if instituted early. The best treatment, however, is prophylaxis.

5. Roentgen ray and radium, when used properly and with care, are not a danger to the patient or the operators.

6. Because of the present wide-

spread use of fluoroscopes, radium and roentgen-ray apparatus, especially by general medical men and dentists, I believe that great care should be taken in protecting the operators.

7. I advise the adoption of the measures recommended by the Royal College of Physicians and the American Roentgen Ray Society.—K. R. D.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

WHAT IS FIRST AID TO THE INJURED? *G. R. G. Fisher. Nation's Health, Jan., 1925, vol. 7, pp. 11–12.*

The value of training the layman in first aid lies in the fact that doctors are not always at hand in the first ten or fifteen minutes after an accident occurs, in which time it is often decided whether the victim is to live or die. The author gives a set of fifteen rules for first aid.—E. S. C.

ALCOHOLISM AND INDUSTRIAL ACCIDENTS. *T. Voionmaa. Internat. Labour Rev., Feb., 1925, vol. 11, pp. 200–228.*

The author presents evidence which he carefully weighs. He finds that much of the material usually relied on is statistically unsound. Nevertheless he does not doubt the conclusions arrived at and shows that when records are sufficiently well kept, the deduction may fairly be drawn that alcoholism exerts an important influence on the occurrence of accidents. One way in which it does this is indirect, by increasing labor turnover, which is considerably greater among drinkers than others; green labor is well known to be more liable to accidents than experienced labor. Chronic or confirmed alcoholism has today more influence on accidents which occur outside working hours than on accidents during working hours, because industry is so organized that confirmed alcoholics are not usually retained in employment. At the same time industrial drinking, that is to say drinking during work, is becoming less and less prevalent and prevails only among such workers as dock laborers, builders, and seamen, all of whom suffer a high accident rate.

Convivial drinking by interfering with a worker's physiologic control does definitely influence the accident rate, evidence of which is quoted from the Ilseder foundry and Weisbaden breweries. Doubt is thrown on the soundness of the oft-quoted tendency for Monday to exhibit a greater accident rate than other days of the week; the only accepted evidence on this point comes from a British investigation made during the war period. On the other hand, evidence drawn from accident prevalence during night shifts on which men may embark after convivial drinking, as compared with day shifts, is definitely adverse to the influence of alcohol. The evidence in this article is carefully presented and no bias is shown. Hence the conclusion drawn that alcohol consumption has harmful effects is the more important, as is also the final pronouncement that it is to the interest both of the chief of the industry and of the

workman to fight with all possible means against the redoubtable enemy alcoholism.—E. L. C.

HAZARD OF UNSAFE TYPES OF GAS MASKS. *S. H. Katz. U. S. Bur. Mines, Rep. Investigations, Serial No. 2664, March 9, 1925, pp. 5.*

Discarded military gas masks should not be used in industry. Users of gas masks should purchase masks for their particular needs from responsible manufacturers or their agents.

A number of fatal accidents from the use of military masks are described, and some of the safety lessons to be drawn from these accidents. Safe masks for protecting from irrespirable atmospheres are briefly described. Detailed descriptions of these masks and their application in industry are given in previous publications of the Bureau.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

THE AMOUNT OF ENERGY EXPENDED BY MENTAL WORK. *Berlin Letter, Jour. Am. Med. Assn., March 28, 1925, vol. 84, p. 999.*

In a series of very carefully conducted experiments on six subjects accustomed to mental work, Ilzhöfer of Munich has been investigating the amount of energy expended by lighter and heavier forms of mental work. In his estimates he followed the Krogh method of computation. During the performance of the mental work, the various experimental subjects, who assumed an extended supine position, were observed to present more or less individual peculiarities of breathing. During intense mental work, respiration in all subjects became accelerated, and in many persons more irregular than under conditions of mental rest or during light mental employment. Taking the energy used during mental rest as a standard for comparison, the caloric expenditure during light mental work increased, on the average, 1.6 per cent., and during intense mental work, 5 per cent. In the first case, the increase was very slight—scarcely worth considering, in fact; in the second case, the increase was, to be sure, somewhat greater but yet, comparatively speaking, very slight. But even this slight increase in caloric expenditure must be due, in part, to accelerated respiration; to various muscular movements associated with the mental work (change of head position, the action of the eye muscles), and to greater muscular tension. After carefully weighing all the factors, the author concluded that there was no evidence that the metabolism occasioned by mental work had increased the total energy exchange to any appreciable extent.—K. R. D.

DAY-DREAMING AND OUTPUT IN A SPINNING MILL. *E. Mayo. Jour. Nat. Inst. Indust. Psychol., Jan., 1925, vol. 2, pp. 203–209.*

The labor turnover in the spinning department of a certain textile mill was 250 per cent. per annum, while that of the other departments was only 5 or 6 per cent. The hours were

not unduly long (two five-hour spells a day for five days a week), but the work, which consisted in walking up and down between the spinning frames and joining the broken threads, was monotonous. It was found that nearly all the workers suffered from foot trouble, while their reveries were apparently uniformly pessimistic, and led to outbursts of unreasonable anger. The management agreed to institute two or three ten-minute rest periods in each of the work spells, in which the workers were permitted to lie down in comfortable positions. Morale rapidly improved, and output began to go up, though the men felt less fatigued than before. However, in response to a heavy demand for goods, the rest periods were abandoned, and very soon output fell, and the old pessimistic reveries returned in full force, accompanied by some of the former symptoms of fatigue. A system was then installed in which the spinning mules were shut down for ten minutes at a time, four times a day, and all hands lay down and rested. In spite of the fact that the machines could not be speeded up, so as to compensate for the loss of working time, the output rapidly rose from a 70 per cent. efficiency in March to one of 80 per cent. in May, and in the next month, June, it reached 85 per cent. In addition, absenteeism diminished and labor turnover fell to nil, while the mental attitude of the men to their work was cheerful and normal.—H. M. V.

HEAT, COLD, AND HUMIDITY

Effective Temperature with Clothing (Equivalent Conditions of Temperature, Humidity and Air Movement, Determined with Individuals Normally Clothed). *C. P. Yagloglou and W. E. Miller. Jour. Am. Soc. Heating and Ventil. Eng., Jan., 1925, vol. 31, pp. 59–70.*

The object of this paper is to present a normal scale of effective temperature for ordinary conditions of life, as determined with individuals normally clothed and slightly active.

The subjects of the experiments were clothed in garments suitable for all seasons of the year. The clothing consisted of light-weight union cotton underwear, madras shirt with collar attached, a three-piece medium-weight woolen suit of medium-sized mesh, cotton socks, and shoes.

The activities of the subjects during all tests were those incidental to carrying out the experiments, involving walking from one chamber into the other, manipulating valves for controlling the temperature conditions, taking readings and mentally concentrating on the comparative feeling of warmth of the two conditions.

The method of determining equivalent conditions was about the same as that recorded in previous effective temperature experiments, *viz.*, "in finding a condition of comparatively high dry-bulb temperature and low humidity in one chamber, which gave the same feeling of warmth as a saturated condition with lower temperature in the other chamber. In the experiments with air movement, the humidity in the two chambers was

kept the same, but the dry-bulb temperature in the velocity chamber was, as a general rule, higher than that in the still-air chamber thus counterbalancing the cooling effect of wind."

Considerable difficulty was experienced by the subjects when first starting this series of experiments in comparing the temperature conditions with a reasonable degree of accuracy. Eventually, however, the subjects were adapted to the new routine, and became proficient in analyzing their feelings in terms of the warmth sensed by the shoulders and chest areas of the body, which were found to be most sensitive of the covered parts.

The Human Thermometric Chart presents the authors' data in such a way that variations in cooling power of air produced by changing temperature, humidity, or air movement in any combination can be determined almost at a glance.

Within fairly definite limits the authors' results indicate that greater cooling will be obtained by working stripped to the waist; but if the humidity and temperature increase beyond the limits, it is better to work clothed in garments and thus increase the body heat lost by evaporation and reduce the heat taken up by convection and radiation from the surrounding air.—P. D.

WORK TESTS CONDUCTED IN ATMOSPHERES OF HIGH TEMPERATURE AND VARIOUS HUMIDITIES IN STILL AND MOVING AIR. *W. J. McConnell and C. P. Yagloglou. Jour. Am. Soc. Heating and Ventil. Eng., Jan., 1925, vol. 31, pp. 35–57.*

This paper presents results of experiments conducted with subjects doing measurable amounts of work at a constant rate in still and in moving air of various temperatures and humidities.

After a preliminary rest until pulse and rectal temperature showed constant values the subjects performed work consisting in raising a known weight attached to a rope, the latter passing over a pulley and provided with a suitable handle at the other end. The weights were so adjusted that a force of 40 pounds was required to overcome the friction of rope and weight guides, and raise the weight at a uniform height. The distance through which the weights were raised was fixed to 5 feet, so that each pull represented 200 foot-pounds of work done. Each subject was required to raise the weight seventy-five times in five minutes. He then rested for the next five minutes and repeated the work alternately thereafter until compelled to leave the chamber either because of fatigue or because of the severity of exposure. At the lower temperatures the subjects were not required to remain in the test chambers longer than three hours. During the tests the subjects were permitted to drink ice water in any quantity and at any time they wished. The clothing worn by the subjects during the experiments consisted of light-weight work trousers and shoes, very similar to the clothing worn in the previous experiments and in the development of the basic scale of effective temperatures.

Records of changes in pulse rate, systolic and diastolic blood pressures, and rectal temperature were taken at regular intervals and all plotted in clear and well-prepared charts.

In all cases the beneficial effects of

moving air are obvious. Other conditions being equal, the amount of work which could be performed decreased markedly with the increase in percentage of relative humidity.—P. D.

BASAL METABOLISM BEFORE AND AFTER EXPOSURE TO HIGH TEMPERATURES AND VARIOUS HUMIDITIES. *W. J. McConnell and C. P. Yagloglou. U. S. Pub. Health Rep., Dec. 5, 1924, vol. 39, pp. 3075–3088. W. J. McConnell, C. P. Yagloglou, and W. B. Fulton. Jour. Am. Soc. Heating and Ventil. Eng., Jan., 1925, vol. 31, pp. 23–33.*

Using the experimental psychrometric chambers at the United States Bureau of Mines and the Research Laboratory of the American Society of Heating and Ventilating Engineers, the authors determined basal metabolisms by means of oxygen consumption and carbon dioxide production at ranges of 58 to 105 on the effective temperature scale. By tables and curves the results are given for (1) carbon dioxide production, (2) oxygen consumption, and (3) heat production (in calories) per square meter of body surface per hour; curves in which calories of heat production per square meter per hour are plotted against (4) rectal temperature and (5) pulse rate are also shown. The authors believe that the pulse rate gives the most reliable index of variation in metabolic rate with increase in effective temperature.

Difficulties due to inability of the body to function at even metabolic rates with increase in temperatures appreciably above the normal comfort range are pointed out. This factor makes absolute determinations subject to differences of such an order that a large number of determinations under definite time intervals are required before a representative point on a curve may be determined.

From numerous experiments of much the same type done by the reviewer but using Roth's modification of the portable Benedict metabolism apparatus, instead of the respiratory gas analysis method used by the authors, it is found to be of the utmost importance to determine first the normal basal metabolism at normal effective temperature and then the increase due either to decrease or to increase in effective temperature.

The question of clothing, recently shown by Benedict to be so important in controlling body surface temperature in basal metabolism, is dismissed with the statement: "The clothing worn by the subjects during the experiments consisted of light weight union underwear, work pants and shirt, socks and shoes."

The authors conclude that:

1. Carbon dioxide produced and oxygen consumed increase with exposure to high and low temperature.

2. Heat production increases with exposure to high and low temperature.

3. There is a zone of minimum metabolism between 75° and 83° effective temperatures within which basal metabolism should be measured.

4. The metabolic rate becomes excessive when the temperature of the environment exceeds the body temperature.—P. D.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

THE NINTH REPORT OF THE ADVISORY COMMITTEE ON ATMOSPHERIC POLLUTION (BRITISH AIR MINISTRY) FOR YEAR ENDING MARCH 31, 1923. *H. M. Stationery Office, 1924, pp. 59.*

A glance at the table of contents of this report is sufficient to convince the reader of the practical utility of the Committee's work on developing sensitive methods of determining small particles in air and the significance of such particles in atmospheric pollution.

Detailed tables of results obtained by the Committee's automatic continuous filter and by Owens' jet dust counter are given and the tabulated results plotted in convenient form.

Section 4 is devoted to an account of experiments with the jet dust counter aimed toward widening the scope of the instrument by studying: (*a*) difference of pressure applied to produce the flow in the jet; (*b*) width of slot; (*c*) depth of cell; (*d*) form of cell; (*e*) form of slot. In atmospheres such as dense fogs, containing abnormally high numbers of particles, it is suggested that two slots instead of one be used thus giving two ribbons each with a less dense deposit than would be obtained with one. Improvements in methods of mounting records from the jet dust counter are given, as well as a discussion of the use of dark-ground illumination and of polarized light. Detailed studies of the different types of particles are given at some length and illustrated by photomicrographs. The formation of aggregates, shapes of particles, and hygroscopic nuclei are also discussed.

A particularly interesting but brief subdivision is that entitled "Electrical State of Particles—Brownian Movement and Settlement," in which an instrument for investigating particle charges is described and shown by photographs.

Section 5 is devoted to "Researches on the Effect of Atmospheric Pollution upon Visibility," and describes the instruments devised and used by the Committee for photometric studies of particles suspended in air. Three methods are under study:

1. Observation of a standard illuminated surface by means of a surface brightness photometer placed at different distances from the surface.

2. The use of a contrast photometer together with a special source of light, arranged to eliminate the effects of scattered light and permit of readings being taken during the daylight. A contrast photometer may be defined as an instrument by which the illumination of two adjacent surfaces may be compared.

3. A combination of the principles of (1) and (2) in which the effect of scattered light may be eliminated by simultaneous observations of a black surface placed adjacent to the illuminated surface.

Results obtained by the first two methods are given in detail and shown to be in close agreement with results from simultaneous determinations made by the jet dust counter and automatic filter. Of special interest is the fact that the contrast photometer method apparently applies with equal accuracy to atmospheres widely varying in content of suspended particles.—P. D.

REPORT OF THE SMOKE ABATEMENT CONFERENCE HELD AT THE TOWN HALL, MANCHESTER [ENGLAND] NOVEMBER 4TH, 5TH AND 6TH, 1924. *Smoke Abatement League of Great Britain, pp. 301.*

The report is printed in convenient pamphlet form, with four pages devoted to the program of the conference.

Sixteen papers are given in full on the general subject of combustion of fuels and its relation to smoke pollution. Dr. J. S. Owens presented a paper on "Air Pollution," in which he summarized briefly some of his data presented very fully in the Ninth Report of the [British] Advisory Committee on Atmospheric Pollution for the Year Ending 31st March, 1923 (see THIS JOUR., 1924, vol. 6, Abstr. Sec. p. 100).

"The Effect of Smoke on Vegetation" was presented by Professor Cohen of Leeds, with photographs illustrating the damage done to plants by smoke:

> The normal growth of a plant depends mainly on the free access of light, on free transpiration from a clean leaf surface and upon the nature of the soil. It can be clearly demonstrated that smoke injuriously affects vegetation in every one of these respects.
>
> A very important—perhaps the most important—feature of the smoke problem lies in the nature of soot. Soot consists mainly of carbon, tar and ash (mineral matter), together with small quantities of sulphur, arsenic and nitrogen compounds, and frequently possesses an acid character.

Attention is called to the tarry matter in soot, which causes it to adhere strongly to any object on which it falls. In concluding, Professor Cohen draws attention to the fact that soot and smoke from industrial centers often travel 50 miles or more. In the discussion which followed this paper, Dr. Des Voeux remarked that smoke from London now reached out about 60 miles.

Dr. Leonard Hill and Dr. R. V Clark presented papers on "The Effect of Light on Health," and emphasized the importance of sunlight, both as a curative and as a preventive measure in many diseases. Since smoke pollution means a diminution in sunlight, this phase was dwelt upon in both papers.—P. D.

THE OCULAR PRINCIPLES IN LIGHTING. *C. E. Ferree and G. Rand. Reprint No. 14 from the Illuminating Engin. Soc., pp. 22.*

This paper deals with the ocular principles involved in lighting, their relation to the various types of concrete lighting situations and their utilization in explaining the effects of lighting on the eye. The following points are covered: a brief survey of the development of lighting in relation to the eye; a statement of the problems involved; reasons for the failure of the earlier attempts to solve these problems; the factors in lighting and an analysis of the act of seeing; the visual functions affected by each of the lighting factors; tests devised for the study of the effects on the eye; the results obtained with these tests and their bearing on the problems of lighting; an explanation of the effect of each of the lighting factors on the powers and welfare of the eye; and a discussion and explanation of the causal relation of lighting to the abnormalities of the eye. Other features are a discussion and explanation of the

phenomenon commonly called eye-strain and a comparison of the indications of the results obtained by the laboratory tests with the results of an ophthalmic survey of the employees of the New York City post offices made by the Office of Industrial Hygiene of the United States Public Health Service.—P. D.

MODERN VENTILATION PRINCIPLES AND THEIR APPLICATION TO SEDENTARY AND INDUSTRIAL LIFE. I. THE RELATION OF TEMPERATURE, HUMIDITY AND AIR MOVEMENT TO HUMAN COMFORT. II. PRACTICAL APPLICATION TO VENTILATION PROBLEMS OF INDUSTRY. *C. P. Yagloglou. Jour. Personnel Res., Feb.–March, 1925, vol. 3, pp. 375–396.*

The comfort of workers in offices, laundries, or foundries is affected not only by the temperature and humidity of the air but also by the rate of air movement. The relation of these three variables is fully discussed from both the theoretical and the practical aspects.

This paper is essentially a careful review of the work on the development and application of the effective temperature scale, all of which has been abstracted in THIS JOURNAL as the several articles were published. In this paper, the theoretical aspects of control of temperature, humidity, and air motion are applied to industrial conditions as found in sedentary occupations—mines, steel mills, and other industries.—P. D.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

ROUTINE URINE EXAMINATIONS IN UNIVERSITY ENTRANTS. *R. T. Legge. Jour. Am. Med. Assn., April 4, 1925, vol. 84, pp. 1030–1031.*

This is a brief report of the results of chemical and microscopic urine examinations of 1,224 men students averaging in age from 18 to 20 years. In this group 4.2 per cent. were found to have abnormal urine findings.

Of the fifty-one students whose urine specimens were regarded as abnormal, the following conditions were present: albumin (faint trace), 34—in the majority of these cases the presence of albumin was determined to be physiologic, as the result either of a preliminary shower or of the escape of prostatic secretion during the excitement of the examination and the straining in the act of micturition; albumin (decided trace), 6; sugar reduction, 3; mucus, 21; pus cells, 17; red cells, 4; granular casts, 4, and hyaline casts, 6.

Of the six men with decided traces of albumin, with or without casts, two were nephritic and one had a history of previous eruptive fevers. In three cases with red and white cells in the urine, two proved to be tuberculosis of the kidney and one a case of nephrolithiasis. The diagnosis was confirmed by cystoscopic and roentgen-ray examination and animal inoculation.

With the exception of one individual none of these students realized that they possessed any kidney or bladder lesions.—K. R. D.

MEDICAL WORK IN WESTERN PLANTS OF PARAFFINE COMPANIES. *N. J. Rich. Nation's Health, Jan., 1925, vol. 7, pp. 46–47.*

The medical work of the Paraffine Companies, Inc., on the Pacific Coast, comes under the jurisdiction of the personnel department. Medical examinations are given as soon as a man is hired, or if he is transferred from one job to another. Dental service is provided, on company time, with collections made by payroll deduction.—E. S. C.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

THE MIND OF THE MINER. *Lancet, March 28, 1925, vol. 1, pp. 670–671.*

Attention is drawn to the presence among British coal miners of unrest out of all proportion to their comparative mortality. The amount of time lost on account of disputes has been higher than in other industries while the amount of unemployment has been less; at the same time mortality rates for accidents and for all causes have been falling, and great disasters have been fewer. Nevertheless within the industry unrest varies on the different coal fields directly with mortality. The suggestion is made that the miner suffers from a "dungeon complex" which incidentally is manifested by his peculiar disease—nystagmus—and that the miner's psychology may be associated with the *raison d'être* of nystagmus, *i.e.*, dim illumination.—E. L. C.

THE MENTAL HYGIENE OF INDUSTRY. *L. J. Pollock. Nation's Health, June, 1924, vol. 6, pp. 384–386.*

"The mental hygiene of industry concerns itself with the employment of suitable individuals for effectual work, the maintenance of their physical and mental health to insure the peak of production, and the prevention and care of accidents which are incident to occupation."

Many cases of nervous and mental disease have been eliminated in recruiting soldiers for armies; industry must have the same problem and must, therefore, make provision for its detection and elimination. Employment departments should concern themselves with three questions: (1) Should the individual be employed; (2) where could he be most profitably employed; and (3) if not employed, what should be done with him? As a sound body and mind are essential for selection for employment, careful medical examinations should be used. Psychologic methods of placement are suggested to determine suitability.

The problem of what to do with those not employed is discussed. Adequate diagnosis of the conditions which determine unsuitability for employment will suggest the disposition of these cases. Where the reasons are mainly medical these persons may be referred to physicians.

The function of mental hygiene after employment is discussed. One must observe the adaptability of employees, the readjustment of painful behavior, feelings, and reactions in order to prevent mental and nervous disease and in order to afford the proper facilities for the treatment of such disease.

The effect of emotional factors on work or production is illustrated and various cases are given. These vary from hysterical symptoms to various phobias. The value of a psychiatric social worker as a member of the employment force is indicated.

In accident cases, especially those where the compensation feature is important, more attention to treatment should be given and less to payment of claims. By adequately understanding the various mental mechanisms involved in these cases, one can shorten the convalescence, hasten the cure, and bring the worker back to his work in a shorter period of time than is usually the case. Lump sum final settlements are advised whereever possible.—H. B. E.

MENTAL HYGIENE IN INDUSTRY. *T. T. Read. Nation's Health, Jan., 1925, vol. 7, pp. 19–22.*

Perhaps the reason for the neglect of mental hygiene in industry is that the technical control of industry is largely in the hands of engineers, who are slow to recognize forces not mechanical. The medical school graduate has little training or interest in psychiatry, and a plant seeking a physician able to bring the psychiatric point of view to its personnel problems has difficulty in finding him.—E. S. C.

PSYCHOLOGICAL TESTS AN ECONOMY IN EMPLOYING. *D. A. Laird. Nation's Health, Feb., 1925, vol. 7, pp. 77–79.*

Psychologic tests should have three qualities: reliability, objectivity, and validity. A test is reliable if it gives the same score to the same person each time he is tested; it is objective if when applied by different users to the same person it gives identical results; and it is valid if it measures what it pretends to. There are 300 tests on the market which have been tried on these three points, and are, therefore, past the experimental stage, except in the one respect that they must be adjusted in validity to the individual plant. After the first year of adjustment they have a tremendous advantage in economy and accuracy over the chance methods of ordinary employment management.—E. S. C.

THE PRACTICAL SIGNIFICANCE OF PSYCHOLOGIC TESTS IN INDUSTRY. *Betke. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 73–74; Dec., 1924, pp. 98–101.*

The author studied the tests used by some of the larger German firms. He divides them into two groups: (1) those used to determine what job a particular person is fitted for; and (2) those used to determine which applicant is fitted for a particular position. For the latter there are many tests, according to the kind of duty to be fulfilled. Some of these tests and methods for the evaluation of the results are given.

The only real control for these tests is to follow up the examined people and determine how close to expecta-

tion they come. If they come within 33 per cent. of their predicted ability, it can only be called an accident. Twenty per cent. is fair, but if their ability can be predicted within 10 per cent. it may be called good correlation.

Recently in choosing employees for the railways out of 5,464 applicants, 1,622 were taken on the strength of their psychologic tests. Of this number 6.4 per cent. failed in their duties. Out of another group of 108 workers not so chosen, 14 per cent. failed. The author concludes, therefore, that psychologic tests are of practical value.—H. E. H.

ECONOMY AND SAFETY IN TRANSPORT. *G. H. Miles. Jour. Nat. Inst. Indust. Psychol., Jan., 1925, vol. 2, pp. 192–197.*

In 1923 there were nearly 3,000 fatal accidents on the roads and streets of Great Britain. In the majority of cases these accidents are caused by failure of the human factor at a critical moment, and it is now recognized that mental fitness is essential in all who have control of rapidly moving vehicles. This has induced many countries to institute tests for transport workers. In Paris, the ability of the candidate to react effectively and rapidly to various stimuli coming from all quarters is tested by seating him in a darkened room, where various signals, such as lights and sounds of a bell, are given. The candidate is instructed to react by pressing certain levers and pedals, the reaction time being automatically recorded. A thorough analysis of the numerous tests is made, much emphasis being placed on the regularity and uniformity of the reaction. An important factor in successful driving is ability to estimate speed. The candidate sits opposite a long bench on which three upright pointers, indicating vehicles, are moving at different speeds, and he is required to make a rapid estimate of the point at which one will overtake the other or where one will meet the other. At Barcelona it was found that thirty-five drivers who did poorly at this test had four times as many accidents as forty-five who did well at them. A comparison of the ability of 136 Paris drivers, as estimated by the various laboratory tests, with their practical performances, showed an agreement in 84 per cent. of the cases.

Other tests employed were those of motor suggestibility, of muscular force and fatigability, of memory, and of the accuracy with which the candidate perceives the essentials of a situation. This last test is made by flashing pictures on the screen for a very short time, and asking the candidate to give details of what he saw.—H. M. V.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

FIFTH ANNUAL REPORT OF INDUSTRIAL FATIGUE RESEARCH BOARD FOR THE YEAR ENDING 31st DECEMBER, 1924. *H. M. Stationery Office, 1925.*

The work carried out by the Board is reviewed under three headings. First comes "particular problems of wide industrial importance" including: hours of labor in reference to which studies of rest pauses during muscular work have been made, while the value of a short rest pause interpolated in a spell of four and one-half to five hours is evaluated at a gain of from 9 to 10 per cent. in output; the effect of dispensing with Saturday work while increasing the period of employment on other days is receiving special investigation. Accident causation has been studied from the individual worker's viewpoint; an undue proportion of accidents are found to occur among a relatively small proportion of workers; but the occurrence of one accident does not tend to increase the liability to another; accidents are more frequent among younger workers; and there is a constant association between accidents and minor ailments. A report on this subject will soon be

published. Another investigation, into the relation between incidence of minor and major accidents, is in progress. Design of machinery, to make it more convenient to work, is in the hands of a specially appointed committee. The physiology of ventilation continues to be pursued and a "hot-wire anemometer" has been devised for use in the investigations. An investigation has been undertaken into the personal rates at which improvement in industry takes place; it will, however, take a considerable time, perhaps years, to elucidate. Under the heading of "specific problems submitted for solution" may be mentioned the study of sickness in cotton weaving sheds in relation to the presence or absence of artificial humidity; other subjects are weight lifting and carrying, which has long been a subject of considerable controversy. An investigation into telegraphists' cramp is being continued; the best methods of lighting composing rooms in printing factories are under investigation; a new inquiry into atmospheric conditions in coal mines has been undertaken; the employment of women as placers and dippers in the pottery trade has been referred to the Board for investigation. Laboratory research is being conducted into principles governing muscular exercise on which several papers have already been published under the supervision of Prof. A. V. Hill; weight carrying, tests for physical fitness, and dynamic and static efforts, among other subjects, are under investigation in the laboratory. Other researches are being made into vocational selection, accuracy of movement, repetitive work, and muscular skill. Clearly the scope of work undertaken by the Board is wide and varied and cannot but prove of great economic value to all concerned with industry.

The report also contains a series of short articles by investigators to the Board. Here Mr. S. Wyatt discusses learning curves in industry, showing how output goes up as skill increases and how the output of those who finally prove to be the best workers goes up much faster than does that of the worst workers; this article is one which should attract interest. Miss May Smith tells of some exceptional work curves and shows how they are related to the mental states of the workers concerned. She analyzes the psychology of "nervy" workers, and shows how the condition might be diagnosed from the work curve. The problem as to how industrial sickness statistics are to be used is clearly set forth by Miss E. M. Newbold, who portrays the almost insurmountable difficulty of obtaining records which may be reliably used for comparing one industry with another; the difficulties are so great that any amateur may be forgiven for leaving the subject severely alone. Other short articles are contributed by Dr. H. M. Vernon on the significance of output in the investigation of industrial efficiency, and by Mr. Weston on the value of personal evidence to corroborate other records.—E. L. C.

VALUES IN THE MAINTENANCE OF HEALTH OF THE WORKER. *E. R. Hayhurst. Am. Jour. Pub. Health, Feb., 1925, vol. 15, pp. 116–121.*

The real values to be aimed at are:

first, the essentials for health of all human beings, *viz.*, control of the environment, personal hygiene, and physical examinations; second, the fundamentals of industrial health which require that the production of all articles or services of human usefulness must include the cost of the maintenance of health; third, the standards for health, now more or less agreed to by hygienists and sanitarians, need actual application to the working class; fourth, organization, both official and nonofficial, for effective administration with qualified personnel. Every state health department should have a division, bureau, or even one person at part time giving attention, not to industrial hygiene, at least at first, but to occupational diseases, believing that the health worker's attention to these end-results of defective health maintenance for the worker will result in an extension of industrial hygiene.

HEALTH HAZARDS IN THE MINING INDUSTRY. *R. R. Sayers. U. S. Bur. Mines, Rep. Investigations, Serial No. 2660, Dec., 1924, pp. 14.*

MAKING THE MINE A SAFE PLACE TO WORK. *R. R. Sayers. Nation's Health, March, 1925, vol. 7, pp. 161–164, 215–216, 218.*

The principal health hazards in the coal mines of the United States are due to abnormal conditions of the air, as the presence of carbon monoxide, hydrogen sulphide, and increased carbon dioxide, oxygen deficiency, high temperatures and humidities, and possible hazards due to breathing dusts.

The hazards due to impure drinking water and methods for obtaining safe drinking water are discussed. A summary of safe methods of sewage disposal in mines is also given.

Miners' nystagmus has not been reported in this country and probably does not exist, owing to the better illumination found in American coal mines.

Beat knee, beat hand, and beat elbow are important hazards in the mines of Great Britain, but cannot be considered so, except in very limited areas, in the United States.

A CONTRIBUTION TO THE INDUSTRIAL HYGIENE OF COTTON SPINNING. *L. Schmidt. Abstr. from Arch. f. Hyg., 1924, vol. 94, in München. med. Wchnschr., Oct. 3, 1924, vol. 71, p. 1413.*

Studies were made in two mills. They included social insurance statistics, bodily measurements, social conditions, and routine medical examinations. Cotton dust predisposes to catarrh of the upper respiratory system but more important are the injuries which weaken the entire body. The methods of working are tiresome but do not call for strenuous effort and therefore the breathing is shallow. The shallow breathing leads to anatomic changes in the chest. A comparison with the peasants shows that these changes are due to the trade. The workers are of the lower social classes who are less able to cope with the dangers.—H. E. H.

LENGTH OF LIFE AND WORKING YEARS OF GLASS BLOWERS. *Gerbis. Abstr. as follows from Ztschr. f. Hyg. u. Infektionskrankh., 1924, vol. 103, in München. med. Wchnschr., Oct. 10, 1924, vol. 71, p. 1446.*

The span of life of glass blowers is

somewhat shorter than the average for Germany. More than half of the workers, however, continue at their jobs until the sixtieth year. The hollow glass blowers are able to continue work for a full ten years longer than the plate glass blowers, for the latter have more irregular and exhausting duties. There does not seem to be any necessity for special laws for the glass blowers but the mouthpieces should be improved so as to prevent infection from syphilis.—H. E. H.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

PRODUCTION OF CANCER AND BEHAVIOR OF MAST CELLS IN MICE TREATED WITH TAR. *E. E. Franco and C. Affonso. Abstr. as follows from Pathologica, 1924, vol. 16, p. 445, in Med. Science, Feb., 1925, vol. 11, p. 377.*

Experiments were made with two different coal tar preparations which were either applied on the shaved skin or injected intraperitoneally. The results obtained were in the main identical with those already described by previous authors. Franco and Affonso have, in addition, observed a considerable hyperplasia of mast cells in mice painted with either of the two preparations used. In one case the mast cells had given rise to circumscribed nodules, which were not, however, delimited by a definite capsule.

THE EXPERIMENTAL PRODUCTION OF CANCER BY ONE APPLICATION OF TAR. *G. M. Findlay. Lancet, April 4, 1925, vol. 1, pp. 714–715.*

On two different dates one application of a chloroform extract of tar heated to a temperature of 70°C. was deposited on the epilated skin of the backs of fifty and twenty-five mice. About twelve months later Findlay found in the thirteen surviving mice three which each had an epithelioma arising on the part which had been painted.

This paper confirms the widely accepted generalization that all carcinogenic agents—such as certain coal and petroleum products, some radiations, and arsenic—possess a prolonged latent incubation stage and that with or without further recognized irritation, in due time, a neoplasm may develop. Exposure must be adequate.—R. P. W.

EXPERIMENTAL SOOT CANCER. *R. D. Passey and J. Carter-Braine. Jour. Path. and Bacteriol., April, 1925, vol. 28, pp. 133–144.*

These workers made three extracts from soot. One was made with ether alone; a second, ether on three parts of soot and one part of quick lime. The third consisted of an ether solution of No. 2, shaken up with a large excess of weak mineral acid. Fraction No. 2 gave the greater number of positive results. It contains all the ether soluble bases, substances, and coloring matters found in soot. This ether extract

was evaporated down into the consistence of syrup and painted in the usual manner on the backs of forty white mice. The first wart appeared after thirty-one applications extending over ten weeks. Three months from the commencement of the experiment, 50 per cent. of the mice alive developed malignant tumors.

This appears to be the first time that cancer from soot has been experimentally produced.—R. P. W.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

OCCUPATIONAL AFFECTIONS. *L. Teleky. Abstr. as follows from Klin. Wchnschr., Feb. 26, 1925, vol. 4, p. 410, in Jour. Am. Med. Assn., April 18, 1925, vol. 84, p. 1242.*

Teleky finds too little interest for occupational diseases. In many fatal carbon monoxide poisonings, evident to any expert, the favorite diagnosis is "heart failure." Exhumation of the body after a few days fails to reveal the carbon monoxide by that time. Lead poisoning is another sad chapter. Some positive diagnoses are incorrect, and many negatives are given in patients suffering from true lead poisoning.—K. R. D.

CLINICAL AND ANATOMICAL OBSERVATIONS IN A CASE OF CARBON MONOXIDE POISONING. *H. Pinéas. Abstr. as follows from Ztschr. f. d. ges. Neurol. u. Psychiat., 1924, vol. 93, p. 36, in Med. Science, March, 1925, vol. 11, p. 456.*

A bilateral symmetrical area of softening was found in the globus pallidus of a woman who, subsequently to carbon monoxide poisoning, had shown the symptoms of Kleist's psychomotor apraxia and died on the thirtieth day. With the exception of some lacunar points of disintegration observed in both putamina, no macroscopic brain lesions were noticed. The case is used by the author to express the view that not only hyperkinesia in Kleist's sense but also akinesia and mixed states of the same kind are very probably due to bilateral lesions of the basal ganglia.

RESPIRATORS FOR ABSORBING CARBON MONOXIDE. *J. I. Graham. Abstr. as follows from Colliery Guardian, vol. 128, pp. 1635–1636, in Chem. Abstr., March 20, 1925, vol. 19, p. 1019.*

Tests are described to determine the efficiency of the Burrell All-Service canister (No. CO-10) and the M. S. A. Self-Rescuer.—P. D.

THE BLOOD IN LEAD WORKERS. *Kretschmer. Abstr. as follows from Deutsch. med. Wchnschr., Oct. 10, 1924, vol. 50, p. 1404, in München. med. Wchnschr., Oct. 31, 1924, vol. 71, p. 1550.*

The basophil stippling and net formation is not due to changes in spongioplasm or inner framework of the erythrocyte. It is caused, partly by the intoxication, by a change in the envelope of the red blood cor-

puscle especially in the quantitative relationship of the protein and lipoid proportions.—H. E. H.

CHRONIC SATURNISM BY ABSORPTION THROUGH RESPIRATORY ORGANS. *A. Mizzi. Abstr. as follows from Atti soc. lomb. sc. med. e biol., 1924, vol. 13, p. 404, in Med. Science, April, 1925, vol. 12, p. 59.*

Experimental investigations meant to show that it is possible to cause in rabbits lesions similar to those of chronic saturnism in man either by intratracheal insufflations of finely powdered lead or minium, or by compelling the animals to breathe in an atmosphere surcharged with powdery materials of the same kind.

TETRA-ETHYL LEAD.[7] *A. Hamilton, P. Reznikoff, and G. M. Burnham. Jour. Am. Med. Assn., May 16, 1925, vol. 84, pp. 1481–1486.*

"A new problem of public health and of industrial hygiene has suddenly arisen in this country as a result of the addition of tetra-ethyl lead to motor car gasoline."

This resolves itself into four phases:

1. The danger to men engaged in the manufacture of tetra-ethyl lead.

2. The danger to men handling ethyl fluid.

3. The danger to filling station operatives and to the public from handling ethyl gasoline.

4. The danger to garage employees and to the public from breathing the exhaust gases from engines using ethyl gasoline.

The danger to men manufacturing tetra-ethyl lead is shown by the fact that eleven men have died and one has become insane in the last seventeen months in the DuPont, General Motors, and Standard Oil companies' plants manufacturing this substance.

The danger to men handling ethyl fluid can possibly be made slight by mixing the gasoline and tetra-ethyl lead in the refineries under well-controlled conditions.

The danger to filling station operatives and to the public from handling ethyl gasoline has yet to be reported on.

The danger from breathing the exhaust gases of automobiles using ethyl gasoline is then discussed at length. In summarizing their criticisms of the recent report from the United States Bureau of Mines (see THIS JOUR., 1925, vol. 7, p. 94) the authors state:

> The use of gasoline to which ethyl fluid has been added constitutes a probable risk to garage workers and a possible risk to the public, of chronic lead poisoning, because the combustion of tetra-ethyl gasoline results in the formation of soluble compounds of lead, the chlorid and bromid (as well as the less soluble sulphate), which compounds pass out with the exhaust gases in the form of light and heavy particles. . . . .
>
> This report of the Bureau of Mines has been critically examined and found to be inadequate in scope, in technic, and in conclusiveness. It cannot be accepted as the final word on the question as to the toxicity of exhaust gases from cars using ethyl gasoline. The further question, of the risk to garage workers, is only lightly touched on in this report, and it also must await a more thorough handling.
>
> Because of the enormous and increasing use of automobiles, the question of the danger to industrial workers and to the public which is involved in the production and handling of tetra-ethyl lead and the use of ethyl gasoline is of the highest importance and calls for a study which will be beyond criticism. Such an investigation

must include an intensive survey of a selected group of individuals who have already been exposed to the gas, under known and varying calcium diet and varying exposure to sunlight. Their excreta should be analyzed for lead. Only in this way can absorption of lead and possible lead poisoning be ruled out., Perhaps of even greater significance is the possibility that the gonads may be injured and posterity be affected, even without any marked effect on the individual. This would necessitate studying the progeny of pedigreed animals. Until investigations of this character have been made, it would seem to be in the interest of public health to suspend the use of tetra-ethyl lead in gasoline.

—P. D.

TETRAETHYL LEAD A MENACE TO GARAGE WORKERS. *C. M. Salls. Nation's Health, March, 1925, vol. 7, pp. 169–171.*

While the chief danger in adding tetra-ethyl lead to gasoline to make "ethyl gas" lies in its manufacture, there is also danger to garage workers from three sources: first, inhaling motor exhaust; second, handling engine parts covered with lead; third, spilling ethyl gas on the hands and clothes. The carbon monoxide hazard now existing in garages is probably greater than a possible lead hazard from exhaust gases of engines using ethyl gasoline.—E. S. C.

DANGEROUS IMPROVEMENT OF GASOLINE. *H. Zangger. Schweiz. med. Wchnschr., 1925, no. 2.*

The author figures that at least 10,000 kg. of lead would be blown into the streets of Zurich in one year if the products of tetra-ethyl lead were used for the improvement of gasoline. On the basis of these figures, he considers that the use of these lead products is dangerous to the community, and he requests the Swiss government to prohibit their importation.—H. M.

DUST HAZARDS AND THEIR EFFECTS

A CASE OF PNEUMONOCONIOSIS WITH AUTOPSY FINDINGS. *J. H. Green. Abstr. as follows from Am. Jour. Roentgenol., April, 1924, vol. 11, p. 358, in Am. Rev. Tuberc., April, 1925, vol. 11, p. 41.*

A case of pneumonokoniosis at first diagnosed as miliary tuberculosis is reported. A history of cough, fever, lassitude, and expectoration of blood suggested tuberculosis. The roentgenogram showed a dense mottling throughout both lungs. The sputum was constantly negative. The true condition was later recognized and the patient advised not to continue work as a stone cutter. This advice was disregarded, all symptoms became worse and death resulted. Roentgenograms taken after death agreed very well with those taken during the course of the disease. The postmortem verified the diagnosis of pneumonokoniosis. Instructive reproductions of roentgenograms accompany the article.

CONTRIBUTIONS TO THE QUESTION OF PNEUMONOKONIOSIS. *W. May and T. Petri. Abstr. as follows from Beitr. z. Klin. d. Tuberk., vol. 58, in München. med. Wchnschr., March 13, 1925, vol. 72, p. 446.*

The pneumonokoniosis of stone

cutters is much more serious than diseases of this kind caused by other industrial dusts—for example, porcelain.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

INDUSTRIAL TUBERCULOSIS. *C.-E. A. Winslow. Boston Med. and Surg. Jour., Jan. 29, 1925, vol. 192, pp. 215–217.*

"The influences of occupation upon the development of tuberculosis are diverse and manifold. There is, for example, the very much neglected effect of posture upon the body. . . . . There is the effect of industrial fatigue, to be reckoned with. There is the influence of general bad ventilation. There is, however, one form of industrial tuberculosis which constitutes by far the most important, I think, of all these problems. This is the tuberculosis in which the inhalation of industrial dusts has played a predisposing and determining part."

The number of dust particles which we detect in the examination of air depends very largely on the method of sampling and analysis. The influence of atmospheric dust on health varies even more with the kind than with the gross amount of dust which may be present. We have little exact and conclusive information as to the effect of organic dusts. Coal dust and cement dust, when inhaled in considerable amounts, appear quite definitely to favor acute respiratory infections such as bronchitis and pneumonia, but if anything tend to diminish liability to tuberculosis. Silica dust, on the other hand, has a peculiar influence in predisposing the tissues to the invasion of the tubercle bacillus. The presence of fine particles of silica dust is one of the most deadly characteristics which the atmosphere can possess, and definite measures for the protection of workers in dusty trades—the use of enclosed or moist processes, the installation of local exhaust ventilation, or the provision of masks and respirators—is of primary importance.

"What we need is, first of all, the discovery of the factories where dust hazards exist; second, a study of conditions by competent analysts for the determination of the actual dust content of the air, and thirdly, the development of protective measures. . . . . I have no doubt at all that the city Departments of Health and the State Department of Labor will be able to carry out this work if the social organizations will bring to their notice the specific plants which need their attention."

ANTHRAX—A CONTINUING AND PROBABLY INCREASING HAZARD OF INDUSTRY. *H. F. Smyth. Am. Jour. Pub. Health, Nov., 1924, vol. 14, pp. 920–924.*

In this paper it was the author's purpose to bring up to date the anthrax morbidity and mortality statistics, to emphasize the continuing and probably increasing risk from this disease both in industry and in agriculture, and to point out the

inadequacy of present methods of disinfection employed in the United States and to show the desirability of further study of the question of the disinfection of hides and skins. It is his opinion that central disinfecting stations would almost entirely remove the hazard for industry and, if at ports of entry, also from railroad handling and trucking. The hazard of handling infected materials would be confined to comparatively few employees who could be scientifically protected and under constant supervision, and disinfection would be much surer and more uniform.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

FURTHER OBSERVATIONS ON LACQUER DERMATITIS. *Toyama. Abstr. as follows from Far Eastern Assn. Trop. Med. Tr. Fifth Biennial Congress Singapore, 1923, pp. 824–829, in Trop. Dis. Bull., March, 1925, vol. 22, p. 231.*

Investigations made with various forms of lacquer showed a common toxic substance "uroshiol" in Japan and China lacquers, "laccol" in the Indo-China, Tsuta-Urushi, and Formosa varieties, and "thitsiol" in Burma lacquer. Describing the action of uroshiol the author points out that infection may occur by the alimentary route, while the common mode of infection is *via* the skin. In such alimentary infections "none of the visceral organs were affected. [This fact] seems to indicate that lacquer poison possesses a specific power to combine with the cells of the skin." The degree of toxicity of the three substances is in the order (1) uroshiol, (2) laccol, (3) thitsiol. Concerning the toxic properties of these same substances, it is shown that this property depends on the combined action of the presence of two hydroxyl groups and unsaturated alkyl radical, the toxicity diminishing with the saturation of the alkyl and successive substitution of the hydroxyl radicals. "In general the toxicity of lacquer is proportional to the amount of toxic substances contained in them." Instructive plates figuring experimental cuti-reactions accompany this interesting communication.

EYE ACCIDENTS. *C. v. Hess. München. med. Wchnschr., Sept. 19, 1924, vol. 71, pp. 1327–1328.*

INDUSTRIAL SURGERY

THE GOOD FIRST AIDER MUST BE SKILLED IN BANDAGING. *G. R. G. Fisher. Nation's Health, March, 1925, vol. 7, pp. 176–178.*

This is the second of a series of articles on practical first aid and is illustrated.—E. S. C.

WHAT SHALL THE INDUSTRIAL SURGEON OF THE SOUTHWEST REGARD AS "TRAUMATIC HERNIA?" *F. T. Hogeland. Southwest. Med., Dec., 1924, vol. 8, pp. 593–595.*

In this paper which was presented at the Tenth Annual Meeting of the

Medical and Surgical Association of the Southwest, Nov. 6, 1924, as a part of the report of the Special Committee on Traumatic and Industrial Hernia (see following abstract) the author recommends that:

1. True traumatic hernia should be compensated.

2. Occupational hernia should not be compensated, excepting in cases of repeated recurrence, but should be surgically repaired at the expense of the employer, with payment of one-half pay during period of disability.

3. Physical examination must be rigidly and painstakingly carried out; it is the key to the situation.

4. Forget the word "traumatic" and use "occupational" in speaking of hernia in industry.

REPORT OF SPECIAL COMMITTEE ON TRAUMATIC AND INDUSTRIAL HERNIA. *Southwest. Med., Dec., 1924, vol. 8, pp. 626–629.*

This report which was submitted to the Medical and Surgical Association of the Southwest, Nov. 6, 1924, contains the following recommendations:

1. Render proper compensation for all cases of true traumatic hernia due to direct violence.

2. Make a physical examination of all applicants for positions in industry, no matter in which capacity; such examinations will determine the fact whether or not a hernia was present at the time of examination.

3. Any case of hernia developing in the course of duty, incident to the man's daily work, should be treated as a disease due to special anatomic weakness on the part of the individual, for which the company is in no way responsible. If it is considered wise under certain circumstances to recognize any moral responsibility, let it be on an economic or humane basis. This moral obligation should be understood to be strictly limited to such employees who had been found apparently free from hernia at the time of previous physical examination.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

FACTORY VACATIONS THAT HELP INSTEAD OF HINDER. *Factory, June, 1924, vol. 32, pp. 829–830, 884–898.*

This article discusses vacation plans from thirty-eight manufacturing companies. Although paid vacations to office workers have become practically customary throughout the country, it is only during recent years that the practice of giving vacations with pay to factory workers has become somewhat more general. Some companies give these vacations only to employees who have been in the service of the company for five years or more; other companies require a shorter period of time before workers become entitled to paid vacations. In some countries of Europe paid vacations are considered a natural right of the worker. In this country the motives underlying the various vacation schemes generally have a different basis. With some, paid vacations are offered with a hope of cutting down avoidable tardiness and illness. With others, paid vacations are given as an added incentive to increase production.

With a few, the motive is to improve the attitude of the worker toward the employer and to improve industrial relations in general. Although the majority of the companies considered in this paper reported success with their vacation plans, a small number have reported failures. A few were not prepared to give an opinion as their experience with paid vacations was not sufficient to warrant giving one.

Practically all of the companies considered gave varying methods of administration which are quite detailed in character. In administration the plans differ mainly in one particular point, and that is the time when vacations are taken. The most common method is to spread the vacations over the summer or the whole year, while a more recent method is that of having practically all workers take their vacations at the same time and combine a shutdown with the vacation period.—H. B. E.

PATRICK-DULUTH SUMMER CAMP AIDS EMPLOYEES' HEALTH. *Nation's Health, Jan., 1925, vol. 7, pp. 49–50.*

The summer camp which has been maintained for seven years by F. A. Patrick & Co., wool manufacturers and distributors of Duluth, Minn., is used freely by the employees for week-ends and holidays as well as vacations. Its beneficial effect can be traced in the minimum of absence on account of sickness in the Patrick corporations.—E. S. C.

THIRD REPORT OF MINERS' WELFARE COMMITTEE FOR 1924. *H. M. Stationery Office, 1925, pp. 60.*

This document describes how during the past year more than £1,000,000 has been spent on welfare in the coal mining industry. The fund is raised under the Mining Industry Act, 1920, from a levy of 1d. on each ton of coal raised. This great scheme is a unique one and each successive Annual Report has demonstrated beyond cavil its success. The original Act only gave the scheme a life of five years, but agreement has been reached that the welfare provisions of the Act shall be extended for another period of five years. Speaking generally, the most popular outlet for expenditure has been on schemes of recreation which have absorbed nearly 67 per cent. of the moneys. The schemes include such things as sports grounds, colliery bands, libraries, swimming pools and baths, as well as playgrounds for children of which a specialty has been made. Expenditure on purposes connected with the health of the miners has come second, taking up 32 per cent. of the money expended. Here the schemes have been fewer in number, but more money has been spent on each; they have been mainly large convalescent homes to which miners can go free of cost. For the most part large country mansions have been bought and converted for the purpose. Another activity somewhat closely associated has been expenditure on pithead baths, a matter in which the British coal fields are behind other countries. The Committee points out that it is only assisting pithead baths during the experimental period and does not contemplate using the Fund for this purpose after successful samples have been erected on the different coal fields. Each report of the Committee has its distinctive feature; this year a scheme of education

takes this place. Attention is drawn to the value of education for safety in mines, since intelligence regarding dangers to which a miner is exposed is at least as important as regulations and safeguards. The scheme of education linking up elementary education with that of the universities has been carefully thought out and when completed will provide for the mining industry unique opportunities. The report contains detailed information as to the expenditure in the various coal fields, and on research into safety and health; it contains several attractive illustrations which display better perhaps than can be done by words some of the ways in which the Welfare Fund is coming to influence the life of the miner.—E.L.C.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

INDUSTRIAL MORBIDITY STATISTICS. *W. Wright. Am. Jour. Pub. Health, Jan., 1925, vol. 15, pp. 31–34; Feb., 1925, p. 121.*

This is a list of pathologic conditions classified into sixteen groups for the purposes of industrial morbidity statistics. The list was prepared by a Special Technical Committee of the National Industrial Conference Board. (See also THIS JOUR., 1924, vol. 6, pp. 357–360; 1925, vol. 7, p. 104.)

NEW GROUPING OF DISEASES OF THE CHEMICAL INDUSTRIES. *F. Curschmann. Zentralbl. f. Gewerbehyg., Nov., 1924, N. S. vol. 1, pp. 75–76.*

The various diseases are grouped according to etiology and according to the organ affected (with the exception of diseases of tuberculous origin). A definite grouping such as this is of value not only in forming statistics for the chemical industries but for comparison with other trades.—H.E.H.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

INDUSTRIAL INSPECTION IN AUSTRIA IN 1923. *Internat. Labour Rev., April, 1925, vol. 11, pp. 542–551.*

Conditions of employment were rather better than in 1922, and the number of unemployed had been reduced. An account is given of the routine work of the permanent inspectorial staff. Women constituted about 26 per cent. of those employed in establishments inspected, and young persons 4.6 per cent. Illegal employment of these protected persons has been the most frequent offense, particularly common in the food trades. Contraventions of the apprenticeship laws were observed with employment on monotonous work of no educational value. The eight-hour day was not yet observed; thus an eleven-hour day was frequent in the Graz Saw Mills; one chamber of commerce even stated that the Eight-Hour Day Act did not apply to apprentices; in Vienna ten to thirty hours overtime a month was quite frequent. Nevertheless slackness in trade was general. Less attention was paid to welfare provision than to producing plant, and employers said workers made little use of washing facilities, the

poor provision for which sufficiently explained the lack of use. An increase in lead poisoning was attributed to the fact that the workers had a lowered power of resistance due to underfeeding and the abuse of alcohol. A feature of the report is the inclusion of several special inquiries; thus rheumatism was found to be practically an occupational disease for transport workers, and after a study of tuberculosis, galalith (used in making manicure sets) is reported to be a most injurious dust.—E. L. C.

INSPECTION OF EMPLOYMENT IN PORTS IN THE NETHERLANDS IN 1923. *Internat. Labour Rev., April, 1925, vol. 11, pp. 551–553.*

This document deals with inspection under the Stevedores Act in the ports of Amsterdam and Rotterdam. The Act permits a sixty-hour week, but by agreement a forty-eight-hour week is adopted. Special attention is paid to safety work in connection with hatchways and lifting apparatus, and to the cleansing of sanitary accommodations and the provision of first aid. Messrooms were available in eighty-seven cases, and wash bowls were provided in many workplaces, while shower baths and clothes lockers are becoming more frequent.—E. L. C.

INDUSTRIAL MEDICAL SERVICE. *D. G. Robertson. Med. Jour. Australia, March 28, 1925, vol. 1, pp. 303–309.*

The Department of Health of the Commonwealth of Australia issued a questionnaire in November, 1924, to the larger employers of labor in order to ascertain the number of existing industrial health services. Dr. Robertson, a member of the Department, has based his article on the replies. Some start appears to have been made in industrial medicine, but this collection of material will become of greater value as time goes on and the start already made expands. Only seven full-time medical men and thirty-three on part time were found. Details are given of the duties carried out in the different establishments. A tendency is reported for treatment to hold the field, rather than prevention, by supervising the health of the workers and educating them in personal hygiene. The author then goes on to outline the true activities of an industrial health service, laying stress on vocational placements of workers; the physical examination of workers either prior to engagement, after absence due to sickness, or in occupations dangerous to health; health maintenance through health lectures, and other matters. Stress is laid on the importance of filing records and of analyzing the information obtained. Educational courses in industrial hygiene for medical men and students are called for, and the conclusion is arrived at that the importance of industrial hygiene has not yet received its due recognition in the medical schools.—E. L. C.

INDUSTRIAL HEALTH PROMOTION IN SMALL PLANTS. *C. P. McCord. Am. Jour. Pub. Health, April, 1925, vol. 15, pp. 299–301.*

The facts emphasized by Dr. McCord are well brought out in his summary.

Ninety-nine per cent. of industries employ 500 or less workers and

utilize 60 per cent. of the industrial wage-earners.

Working conditions and health conditions of workers are generally lower in small plants than in large ones.

Less than 1 per cent. of small plants have at the present adequate medical departments.

In the conduct of industrial medical work, emergency relief is not sufficient. Continuous supervision of physical working conditions, accident prevention, and physical examinations are essential.

Industrial medical work should be carried out on the factory premises.

The monetary returns to the manufacturer from a properly conducted medical department warrant his generous support.

THE PROMOTION OF INDUSTRIAL HEALTH. *C. D. Selby. Am. Jour. Pub. Health, March, 1925, vol. 15, pp. 209–212.*

Dr. Selby reviews the changes which have taken place in the fundamentals of industrial medicine since the war.

In the early days employers were unwilling to give the industrial physician much administrative responsibility. The modern industrial physician, however, is better qualified and consequently employers place more confidence in him. It is he rather than the employers who is responsible for progress in industrial medicine and hygiene.

The transformation of the general practitioner or surgeon into an industrial physician has been very interesting. At first his work was limited to the care of injuries; gradually he applied his knowledge in the direction of preventive medicine, developing the physical examination of applicants for employment.

For the purposes of this report, Dr. Selby divides industrial medicine into surgery, preventive medicine, medical treatment, sanitation, and occupational diseases. Under surgery, he credits the industrial physician with having greatly reduced the occurrence of infections, and with accomplishing, better than ever before, the satisfactory replacement of men who have been badly injured in industry. Striking improvements have taken place in the fields of preventive medicine, sanitation, and occupational diseases; only in the field of medical treatment has there been no great progress, owing to the fact that the average industrial physician and his employer feel that it is somewhat beyond the province of industry to take care of illnesses occurring among the employees where more than one or at most two treatments are required.

In conclusion, Dr. Selby states that the industrial physician "has seen his opportunities in industry, he has accepted them; he has been recognized by industry as an important element, and he is prepared to cover an even wider field. This is the outstanding improvement in industrial medicine. All other improvements are the result of this." Credit must be given the employer for recognizing the fact that industrial medicine is an important element in industrial management, and for his change in attitude toward the workingman.

DEPENDENCY, ORPHANHOOD AND FERTILITY. CENSUS OF ENGLAND AND WALES, 1921. *H. M. Stationery Office, 1925.*

This volume, based on information collected at the 1921 census, contains a wealth of important statistical information, included in which are two studies dealing with fertility according to occupation. The studies are not so comprehensive as the extensive one which was published two years ago and which dealt with information obtained from the census of 1911.[1] Nevertheless they are valuable in bringing the subject up to date on the latest records. Only thirty-two occupational groups are given and they, as may be seen from their titles, are in several instances distinctly composite. Full information as to ages of children and parents is given in the report, but in the list which follows against each group are placed only general comparative figures for rates regarding parents and children at all ages and their families of all sizes.

The list has been arranged according to the average number of children per married man; but if instead we use relative fertility as measured by the ratio of the number of children under 1 year of age to the total number of parents, this order is indicated by figures in parentheses. The results obtained differ pronouncedly for only a few groups. For the most part the same groups stand high or low whichever order is taken. The conclusions to be drawn

[1] Fertility of Marriage. Census of England and Wales, 1911. Vol. XIII. Part II. H.M. Stationery Office, 1923.

OCCUPATION	AVERAGE NUMBER OF CHILDREN PER MARRIED MAN	RELATIVE FERTILITY (RATIO OF NUMBER OF CHILDREN UNDER 1 YEAR OF AGE TO TOTAL NUMBER OF PARENTS)	
1. Mining and quarrying	1.82	0.165	(1)
2. Workers in the treatment of non-metalliferous mine and quarry products	1.69	0.150	(2)
3. Stationary engine drivers, dynamo and motor attendants	1.59	0.133	(8)
4. Fishermen	1.56	0.131	(9)
5. Makers of bricks, pottery, and glass	1.54	0.141	(3)
6. Persons employed in gas, water, and electricity undertakings	1.52	0.111	(18)
7. Workers in chemical processes: makers of paints, oils, etc.	1.51	0.135	(7)
8. Builders, bricklayers, stone and slate workers; contractors	1.44	0.114	(15)
9. Other and undefined workers	1.44	0.137	(6)
10. Persons employed in transport and communication	1.42	0.131	(10)
11. Metal workers (not electroplate or precious metals)	1.41	0.128	(11)
12. Painters and decorators (not pottery)	1.37	0.113	(17)
13. Electrical apparatus makers and fitters and electricians	1.36	0.137	(5)
14. Workers in mixed or undefined materials	1.36	0.123	(13)
15. Workers in other materials	1.31	0.128	(12)

OCCUPATION	AVERAGE NUMBER OF CHILDREN PER MARRIED MAN	RELATIVE FERTILITY (RATIO OF NUMBER OF CHILDREN UNDER 1 YEAR OF AGE TO TOTAL NUMBER OF PARENTS)
16. Makers of foods, drinks, and tobacco	1.30	0.114 (14)
17. Agricultural occupations	1.25	0.101 (22)
18. Makers of textile goods and articles of dress	1.24	0.098 (24)
19. Workers in precious metals and electroplate	1.23	0.113 (16)
20. Workers in skins and leather, and makers of leather and leather substitute goods (not boots or shoes)	1.23	0.101 (23)
21. Workers in wood and furniture	1.23	0.102 (21)
22. Warehousemen, storekeepers, and packers	1.17	0.109 (19)
23. Persons employed in public administration and defense (excluding professional men and typists)	1.15	0.140 (4)
24. Makers of and workers in paper; printers, bookbinders, photographers, etc.	1.13	0.095 (26)
25. Commercial, finance and insurance occupations (excluding clerks)	1.10	0.088 (29)
26. Persons employed in entertainments and sport	1.07	0.104 (20)
27. Persons engaged in personal service (including institutions, clubs, hotels, etc.)	1.05	0.079 (30)
28. Makers of watches, clocks, and scientific instruments	1.04	0.088 (28)
29. Textile workers	1.01	0.093 (27)
30. Clerks and draftsmen (not civil service or local authority): typists	0.94	0.098 (25)
31. Professional occupations (excluding clerical staff)	0.90	0.074 (31)
32. Retired or not gainfully occupied	0.39	0.031 (32)

agree generally with those of the previous more extensive study. Open-air life with hard physical exercise is associated with high fertility; while brain work and indoor life is associated with low fertility. The group which has changed its position most is agriculture; in the previous study it ranked high for fertility, in this study it stands below the middle of the list.—E. L. C.

THE HISTORY OF MINING HYGIENE, WITH SPECIAL REFERENCE TO THE MINES OF THE WITWATERSRAND. *C. Porter. Lancet, April 11, 1925, vol. 1, pp. 799–801.*

This article is an inaugural address opening a course in mining hygiene at the Witwatersrand University. The author opens with some interesting historical references to mining ventilation and to the use of slave labor in mines. He points out that underground mining hygiene is a comparatively modern develop-

ment, and then proceeds to give a survey of what has been done on the Rand, where attention is given to underground drinking water and the disposal of excrement, as well as to technical problems of ventilation. The occurrence of dust phthisis is, however, the particular trouble discussed. A survey of the situation which led up to the establishment of the Miners' Phthisis Act and the Miners' Phthisis Medical Bureau on the Rand is given. The effect of the campaign of prevention which was undertaken is claimed to be entirely satisfactory. Periodic medical examinations once every six months enable the health of the miners to be so carefully supervised that all cases of tuberculosis are being kept out of the mines, and the worker is greatly appreciating the supervision. The results of the campaign against pneumonia inaugurated by Almroth Wright are claimed to have reduced mortality from this disease from 40 to 50 per cent. The lecture is one of considerable interest.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

CARBON-MONOXIDE LITERATURE. *R. R. Sayers and S. J. Davenport. U. S. Pub. Health Bull. No. 150, 1925, pp. 54.*

This is a very useful summary of the entire carbon monoxide question and should be in the hands of all who have occasion to see or treat gas poisoning. Dr. Sayers and the Public Health Service are to be congratulated on Bulletin 150. Dr. Sayers' own summary is a modest expression of the scope of the bulletin (bibliographic references omitted).

SUMMARY

1. References to illness or death from some mysterious element in smoke or vapor from certain materials used for fuel are found as far back as the written record of the human race is available. This pernicious substance was first called "carbon vapor" in 1648 and "carbon gas" in 1667. Carbon monoxide was first made experimentally in 1776.

2. With each development of a more efficient method of producing heat for home and industrial consumption, poisoning by carbon monoxide has increased accordingly until today it has become one of the most widely distributed and most frequent causes of industrial accidents.

3. The symptoms of carbon monoxide poisoning were observed very early in its history and described by different investigators until at the present time all the symptoms that may occur are well known Some of the symptoms are headache, weariness, weakness, dizziness, nausea, vomiting, loss of strength and muscular control, increased pulse and respiratory rates, loss of reflexes, coma with intermittent convulsions, cessation of respiration, death.

4. A knowledge of the pathology of carbon monoxide poisoning developed rather slowly due to unscientific methods of conducting investigations and lack of knowledge of the processes of the human body. Many theories, based on the symptoms of victims of this gas, have been advanced by different investigators. The first real advance toward a true conception of the action of carbon monoxide on the body was made with the discovery of the change in the color of the blood on contact with the gas. This led to the further discovery of the fact that the poisonous action of carbon monoxide is due solely to its power of combining with the red coloring matter of the blood.

5. The discovery that the poisonous action of carbon monoxide is due to its

power of combining with the hemoglobin of the blood led to many experiments to determine the amount of carbon monoxide hemoglobin and of oxygen hemoglobin formed when the hemoglobin comes in contact with the two gases simultaneously, the percentages of carbon monoxide in the air dangerous to breathe, and length of time required for different percentages to cause symptoms. It was found that the affinity of carbon monoxide for the hemoglobin of the blood is about three hundred times that of oxygen. It was found by investigations on animals and on men that exposure to 0.06 per cent. of carbon monoxide in air will cause perceptible effects, and exposure to 0.15 per cent. is dangerous to life; that no symptoms are felt when the saturation of the blood with carbon monoxide is below 10 per cent. but that above 20 per cent. the symptoms appear and increase in severity with the increase in blood saturation until with 60 to 70 per cent. saturation death may ensue, and when the saturation is between 70 and 80 per cent. respiratory failure and death occur.

6. The detection of carbon monoxide in the blood and air and methods of determining the quantity present are essential in diagnosis of poisoning and in avoiding poisoning by indicating irrespirable atmospheres. A number of methods for the determination of carbon monoxide in the blood have been developed, such as the spectrophotometric, the colorimetric, and the gasometric; the ferricyanide method, the method by measurement of the respiratory capacity of the blood, and the method using formaldehyde solution; also a modification of the spectrophotometric method. All these methods have some objectionable features, as requiring elaborate and expensive apparatus, special technic and training on the part of the analyst, or being too delicate or cumbersome for field use. The pyrotannic acid method for determination of carbon monoxide in both blood and air practically overcomes the objections given above, as it gives accurate results in the field and laboratory, is compact and durable, and is simple enough in operation to be used by a person without special training. The iodine-pentoxide method has been developed to a point where an experienced operator can determine as low as 2 parts of carbon monoxide in 100,000 parts of air even when associated with gasoline fumes. Small animals, especially canaries, have been used for years in mine rescue work and are valuable in showing men engaged in exploration work in mines when self-contained oxygen-breathing apparatus needs to be used. The "hoolamite" or activated iodine-pentoxide indicator, a mechanical detector for carbon monoxide, may be used to determine carbon monoxide in air when the concentration is as low as 0.05 per cent.

7. A satisfactory method of treatment of carbon monoxide poisoning was developed only after it was discovered that the combination of carbon monoxide with the hemoglobin of the blood is not permanent and that it can be displaced by oxygen just as it displaces the oxygen, although the former reaction is slower. This led to experiments with the administration of oxygen in cases of carbon monoxide poisoning, which proved to be very successful. The addition of carbon dioxide has been found to hasten the elimination of carbon monoxide from the blood but due to the danger of failure of the heart weakened by severe poisoning, some authors do not unqualifiedly recommend the general use of the carbon-dioxide-oxygen treatment. It has been found that patients and animals treated with oxygen alone after carbon monoxide poisoning recover as early and their after condition is fully as good as when treated with carbon-dioxide-oxygen mixture, although the mixture causes the elimination of carbon monoxide from the blood somewhat more rapidly.—C. K. D.

LEAD STEARATE POISONING IN THE RUBBER INDUSTRY. *H. J. Cronin. Boston Med. and Surg. Jour., May 7, 1925, vol. 192, p. 900.*

Nine employees in a rubber factory were affected by an unusual form of lead poisoning caused by lead oxide or litharge in loose chemical combination with stearic acid and sulphur.

Stearic acid ($C_{18}H_{36}O_2$) is associated with palmitic and oleic acids as a mixed ether in solid animal fats or tallows. It was used in the rubber industry to soften the rubber. The heat of the mill turned solid stearic acid into an oily liquid that flowed over the mixer's hands and arms which were also covered with lead oxide powder.

A black deposit of lead stearate on the exposed parts of the hands, arms, and face was the characteristic symptom. There was slight itching followed by a subacute dermatitis with dryness of the skin, fissures, and desquamation. There were no constitutional symptoms of lead poisoning as this method of using stearic acid was discontinued and the men were put on other employment temporarily. A protective ointment was applied with loose bandages, and after five days the dermatitis subsided.

The author suggests that if stearic acid must be used with lead oxide the workmen should have their arms covered and should wear gloves. On the other hand, there is danger that long sleeves and gloves may get caught and draw the worker's arm between the rollers. Even if the acid is shoveled on to the mill it is often necessary to handle small pieces that drop and to handle the mixed rubber when it is cut from the mill. Scrupulous cleanliness should be observed. It is possible for rubber chemists to combine stearic acid with other solvents in such a way as to prevent the reaction with lead on the workers' arms.

DUST HAZARDS AND THEIR EFFECTS

STUDIES ON THE INDUSTRIAL DUST PROBLEM: II. A REVIEW OF THE METHODS USED FOR SAMPLING AERIAL DUST. *L. Greenburg. U. S. Pub. Health Rep., April 17, 1925, vol. 40, pp. 765–786.*

The author is chiefly concerned with the industrial aspects of this problem, and all discussion of methods of sampling proceeds from that point of view. In his opinion, the ideal instrument for sampling dusty atmospheres is one which efficiently retains particles of 1/2 to 10 microns in size. From the collected sample, counts of the particles should be made; for "the count is the best index of the extent of the atmospheric pollution."

Referring to the value of weights as compared with counts, Dr. Greenburg says, "because one large particle may weigh many hundreds of times more than a smaller one, the weight of a given sample of dust must be used only as an additional guide in the interpretation of results, and then with some degree of caution."

In contrast with this opinion is that of the South African investigators, who record dust either in counts or weights and find the relations reliable. (Mavrogordato, A.: The Value of the Konimeter—Being an Investigation into the Methods and Results of Dust-Sampling as at Present Practised in the Mines of the Witwatersrand. So. African Inst. Med. Res., Pub. No. 17, Aug., 1923. (See THIS JOUR., 1925, vol. 7, Abstr. Sec., p. 16.)) Owens has also shown in the Ninth Report of Advisory Committee [British] on Atmospheric

Pollution for the Year Ending 31st March, 1923, pp. 44–57 (see THIS JOUR., 1924, vol. 6, Abstr. Sec., p. 100) that the same relation occurs in the case of the more uniform but extremely small particles which are of importance in air pollution.

In his enthusiasm for counting, Dr. Greenburg overlooks the fact that the large particles occur in the air with very much less frequency than the small particles.

This review of methods of sampling aerial dust covers seventeen pages. It includes brief descriptions of the various types of apparatus and is followed by a comprehensive bibliography.—P. D.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

OCCUPATIONAL AND OTHER CAUSES OF PULMONARY FIBROSIS. *T. Oliver. Brit. Med. Jour., April 11, 1925, vol. 1, pp. 685–687; Editorial, pp. 707–708.*

Sir T. Oliver in his address recounts how his attention was directed to gold miners' phthisis more than twenty years ago, and then points out how modern research has put on one side the idea that dust causes pulmonary fibrosis through irritation in favor of this change resulting from chemical action; even so-called insoluble silica dust appears to pass into solution in the lungs. The conditions of atmospheric dust in Cornish mines are described. Attention is then drawn to the possibility of fibrosis resulting from inhaling various dusts, such as asbestos which, however, contains silica. Attacks of microbic organisms, as in the case of pneumonia, may be followed by fibrosis, but evidence of any particular predisposition to tuberculosis in such instances is not definite. Fibrosis due to silica may run a fatal course without any tuberculous infection, but such infection usually expedites the end. The author reports research now in progress to ascertain the disposition of dust particles directly injected into the blood stream. The importance to the whole question of pulmonary tuberculosis of a thorough investigation into silicosis is considerable, and the research in progress, following on the lines adopted by Drinker, must be watched with interest.—E. L. C.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

ASPARAGUS DERMATITIS. *A. Sternthal. Dermat. Wchnschr., Feb. 14, 1925, p. 254.*

In Brunswick this trouble has been well known to the writer for thirty-seven years. In the sixty large preserving factories in the neighborhood, about 10,000 workers, roughly speaking, 90 per cent. women, are employed. They work ten hours a day and during the season each person clears and prepares about 1 hundredweight

of asparagus daily. The disease is known as "asparagusitch." A similar disease occurs in the bean country among the bean workers.

Precautionary measures were issued in 1914 by the trade inspection office of the Duchy of Brunswick. Dr. Roth has advised that sufferers from either of these "trade itches" should be excluded from the employment.—R. P. W.

BAKERS' ITCH AND WORKMEN'S COMPENSATION. *Lancet, May 30, 1925, p. 1163; June 6, 1925, p. 1205.*

Dr. J. T. Ainslie Walker attributes bakers' itch to the use of so-called "improvers," one of the commonest of which is potassium persulphate. This compound, on the addition of water, reacts to form oxygen and acid potassium sulphate. He considers that the absence of bakers' itch in France and America is due to the fact that this substance is not used in those countries.

Dr. R. Prosser White replies that bakers' itch occurs in the confectionery trade where no improvers are used, and also among bakers using flour which does not contain improvers.—E. L. C.

PHYSIO-PATHOLOGY OF OCULAR FATIGUE. *G. Oblath. Abstr. from paper read before the Congress of Hygiene, Paris, 1924, in Brit. Jour. Ophth., Jan., 1925, vol. 9, pp. 24–26.*

In the present paper the author does not deal with the results on the ocular apparatus, but makes an analysis of the direct and indirect causes of ocular fatigue.

Among the direct causes of ocular fatigue he places at the head of the list the intensity of the light. Deficient illumination is of the first importance, since it causes the workman to approach too near his work and so affects his convergence and accommodation, and finally the whole visual apparatus. . . . . He also points out how the ocular and general fatigue due to insufficient illumination predisposes to industrial accidents. Excessive illumination also produces its own evil effects, but is not so common in industrial conditions.

. . . . Ocular fatigue depends equally on the brightness of the source of illumination and on the nature of the work and its relation to the light distribution. Light contrasts are also of importance in certain occupations. The brightness of the source of illumination has much more influence on the pupillary movements than has its distance. The irregular contractions of the pupil produced by too intense a source of light deprive the eye of part of its natural protection. It is also of importance that the source of light should be stable and not vitiate the atmosphere or raise the temperature. Rules have been drawn out for the position of the source of light, due attention to which reduces both ocular fatigue and the risk of accident. Further, the position of the source of light is of importance for the effect produced on the retinal periphery. . . . . The quality of light is of great importance. The eye only perceives one-tenth of the solar spectrum, that is to say, radiations of a wave length between 0.76 and 0.396 micron. The invisible rays may produce serious damage from their thermal or chemi-

cal action. . . . . In the estimation of the sufficiency of illumination the color factor should receive attention. The human eye is best adapted to radiations corresponding to the middle part of the solar spectrum; blue is the most fatiguing color, and green the least. . . . .

Among the indirect causes the attention necessary to certain responsible work (engine drivers, chauffeurs) is of great importance. To this must be added the fatigue due to strained position. Other causes are to be sought in the smallness of the work (tailors, watch-makers, workers in precious stones) and in the unsatisfactory physiologic conditions of life led by the workers. The correction of errors of refraction is of great importance as these, especially marked degrees of astigmatism, predispose to ocular fatigue. . . . . Much has been written on the connection of near work and myopia. The natural selection of work best adapted to their visual conditions combined with heredity accounts for the predominance of myopes in certain professions. . . . .

Professor Oblath finished his paper with the following conclusions:

The school doctors should be consulted on the choice of a profession especially in relation to the visual function. . . . . Persons with only one eye should not be allowed to choose a profession which implies a permanent risk to the sight.

Ocular fatigue will be avoided by a careful examination of individuals at the time of entry into a profession. Ocular troubles (errors of refraction, of accommodation, or of the muscular apparatus) incompatible with the exercise of a profession should be rigorously treated and verified in the course of later visits. It will be noted that the visit on engagement has considerably reduced the number of accidents, and renders the work of the experts engaged in estimating the sequelae of industrial accidents easier. In so far as there is no real professional myopia, this preventive visit will permit of the determination of the aptitude of the individuals for special work, and will suggest further the hygienic measures suitable for the elimination of the causes of injurious complications.

The use of appropriate glasses will prevent the troubles of ocular fatigue and the pathological changes due to injurious radiations. The spectacle frame should be simple, not easily heated, and capable of being worn continuously. The choice of lenses will depend entirely on the nature of the work; they should arrest all injurious radiations and be controlled spectroscopically.

In addition to these fundamental principles of hygiene in connection with the visual apparatus, a satisfactory organization of the work will aid in the struggle against ocular fatigue. The work should not be excessive, nor prolonged beyond physiological limits; the duration being naturally proportional to the nature of the operations performed. In work necessitating minuteness and rapidity, frequent interruption (*pauses intercalaires*) of the work will act as an efficacious means of preventing ocular fatigue.

INDUSTRIAL SURGERY

BACKACHE DUE TO INDUSTRY AND DISEASE. *J. W. Sever. Boston Med. and Surg. Jour., April 2, 1925, vol. 192, pp. 647–658.*

A definite routine in the examination of any back case is essential, so that nothing will be overlooked. The history is important, and the method

by which the injury was sustained is often of great assistance in making a diagnosis.

The causes of injury are most varied, and may be intrinsic or extrinsic, that is, direct or indirect injury. An adequate knowledge of the method of injury is most helpful—was the injury direct or indirect, the spine flexed or hyperextended, a blow, a fall, a lifting strain, and if so what was the position of the person at the time? All this helps in determining not only the anatomic localization of the injury, but the possibility of bone or soft part lesion, as well as the probable duration of the disability. Another important factor is the actual condition of the spine previous to the trauma.

The traumatic injuries discussed are divided into three classes: (1) those due to lifting strains; (2) those due to contusions of the back from a fall or by being struck by some object, the injury being only to the soft parts; and (3) those due to any accident where there has been bony injury to the vertebral body or one or more of its appendages. Eight X-rays illustrate the discussion of class 3.

Under backaches due to disease and posture, the author discusses spondylolisthesis, camptocomia or bent back, postural strain, rheumatoid arthritis and tuberculosis of the spine, osteomyelitis, and sacro-iliac strain.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

STUDIES ON THE RESPIRATORY ORGANS IN HEALTH AND DISEASE: XIV. THE VITAL CAPACITY OF THE LUNGS OF 419 FIREMEN. *J. A. Myers and LeRoy M. A. Maeder. Arch. Int. Med., Feb., 1925, vol. 35, pp. 184–203.*

This is one of the papers mentioned as forthcoming by Dr. Myers in his article in THIS JOURNAL on "Vital Capacity of the Lungs and its Practical Application" (1925, vol. 7, pp. 25–42).

This article on Minneapolis firemen deals statistically with their vital capacity as related to various other physical data. The method followed is that of giving tables showing arithmetic averages with maximum and minimum values from which graphs are constructed showing central tendencies and from which also empiric formulas are derived by the method of weighted averages. The observed and calculated vital capacities are compared and absolute and percentage deviants are tabulated. Secondary tables show the relative increase or decrease of the vital capacity with respect to the measurements in question as follows:

1. In relation to standing height. The absolute vital capacity at a body length of 63 inches (160 cm.) is 3,419 c.c. which increases to 5,817 c.c. at a standing height of 78 inches (198.1 cm.) or approximately 160 c.c. for every inch of stature.

2. In relation to sitting height.

3. In relation to age. A steady decrease is noted from 5,036 c.c. at 20 years to 3,485 c.c. at 65 years, or approximately 172 c.c. for every five years. This is thought to be

related partly to a loss of elasticity in the walls of the alveoli. The age at which this decrease is first noted is earlier than that given by other authors.

4. In relation to body weight. Lung growth accompanies the growth of the body in length rather than increase in weight after the age of 21, at which this study begins. For a given individual the vital capacity tends to remain the same even though the body weight may increase by the deposit of fat.

5. In relation to the length of service in the fire department. This appears to be little but a repetition of the age data.

The table reproduced below states the formulas used, with Y in each case used for the vital capacity in cubic centimeters and X the particular measurement in the unit indicated. The "average weighted deviant" expresses the accuracy of the formula and shows the closeness with which the observed approach the calculated figures, both actually and in percentages. It will be seen, for instance, that the formula ought to foretell the observed vital capacity of an individual in such a group as this within an average accuracy of 104.1 c.c. if standing height is used (2.33 per cent.) whereas the deviation in the case of weight is up to 140.3 c.c., or 3.19 per cent., although of course in both cases individual variations run considerably higher.

A brief note compares the data assembled with the formulas of West for surface area and standing height and with those of Dreyer for weight. The surface area curve and Dreyer's curve nearly coincide. This group of firemen gives figures well within the range of the ordinary variation in these measurements.—A. H. T.

FORMULAS OF VITAL CAPACITY WITH THE AVERAGE WEIGHTED DEVIANTS

(*Y, Vital Capacity in Cubic Centimeters*)

X	FORMULAS	AVERAGE WEIGHTED DEVIANTS	
		Absolute, C.C.	Per Cent.
Standing height, inches	$Y=159.9X-6,655$	104.1	2.33
Sitting height, inches	$Y=218.9X-3,299$	112.8	2.53
Body weight, pounds	$Y=0.46X+4,350$	140.3	3.19
Age, years	$Y=5,725-34.46X$	116.2	2.69
Length of service in fire department, years	$Y=4,840-34.84X$	150.2	3.52

THE RESPIRATORY ORGANS IN HEALTH AND IN DISEASE: XVI. A COMPARISON OF THE VITAL CAPACITY STANDARDS IN THREE THOUSAND FIVE HUNDRED AND THIRTY-FOUR MALE UNIVERSITY STUDENTS. *W. P. Shepard and J. A. Myers. Arch. Int. Med., March, 1925, vol. 35, pp. 337–346.*

References are made to the previous standards derived from the measurement different groups of healthy young men. In this instance particular care was taken not only in securing accurate measurements but in using a very highly selected group of 1,641 for the normal standards. The students eliminated who are usually included among the healthy were those who had a past history of pneumonia, of pleurisy, or who were 10 per cent. or more underweight or overweight. Smaller numbers were excluded for compensated heart disease, past tuberculosis, for a variety of thoracic abnormalities, and for certain chronic diseases.

The 1,641 normal students were compared with Myers' tables (see *Am. Rev. Tuberc.*, May, 1923, vol. 7, p. 161) based on formulas of West and Dreyer for surface area, height, weight, chest circumference and sitting height. The two first mentioned coincided most closely; with the weight formula, scarcely less well. The other two were not so good, for the chest circumference formula gave readings too low and the sitting height formula too high. The whole group tended to be slightly above 100 per cent. of the standards, which was perhaps natural in view of the rigid selection.

The study of abnormals was interesting since the after effect of pulmonary and cardiac disease shows clearly. The overweights and underweights are also slightly below their normal comrades. Emphasis is therefore placed on the care which should be used in selecting groups to be used as standards.—A. H. T.

1. Observations on the Taking up of Carbon Monoxide by the Haemoglobin in the Spleen. *J. Barcroft and H. Barcroft. Jour. Physiol., 1923, vol. 58, pp. 138–144.*

2. Observations on the Taking up of Carbon Monoxide by the Haemoglobin of the Spleen. *A. Hanak and J. Harkavy. Ibid., 1924, vol. 59, pp. 121–128.*

3. The Mechanism of the Splenic Reaction to General CO Poisoning. *S. de Boer and D. C. Carroll. Ibid., pp. 312–332.*

4. The Effect of Splenectomy on Carbon Monoxide Poisoning. *J. Barcroft, C. D. Murray, and J. Sands. Ibid., pp. xxxvii–xxxviii.*

Abstracted as follows in Med. Science, April, 1925, vol. 12, p. 19.

These papers are of great general interest because they show one important function of the spleen. The research was suggested by finding that in some cases of experimental carbon monoxide poisoning the hemoglobin of the spleen was combined with carbon monoxide while in other cases it was not.

1. The first paper shows that in rats breathing 0.1 per cent. carbon monoxide there is a lag of from thirty to ninety minutes between the percentage of carbon monoxide hemoglobin reached in the spleen pulp and that in the general circulation.

2. The second paper shows that in guinea-pigs, rabbits, and cats, as well as in rats, a longer time is needed to reach the point of equilibrium with carbon monoxide hemoglobin in the spleen pulp than in the general circulation. But if the animals are handled and kick about, carbon monoxide goes into the spleen relatively rapidly, so that in two minutes the spleen pulp may contain as high a percentage as it generally does after two hours. It is suggested that during activity nervous impulses pass to the spleen which increase the rhythmic contractions, so that the blood of the spleen is better mixed with that of the general circulation instead of remaining in a relatively independent backwater.

3. The third paper contains a large number of careful experiments which prove that the diminution of volume of the spleen following carbon monoxide poisoning is not due to vasoconstriction, but to contraction of the spleen muscle. It depends on

the nervous connections of the spleen being intact and the stimulus is lack of oxygen acting possibly reflexly, more probably on the spinal cord. In this way unpoisoned red cells are driven out into the circulation and reduce the proportion of carbon monoxide hemoglobin to oxygen hemoglobin in the general circulation.

4. The fourth paper describes experiments to test whether these possible functions of the spleen are of real practical importance or not. Normal guinea-pigs, others without spleens, and others in which some other abdominal operation had been performed were exposed in a chamber to carbon monoxide. In every case the animals without a spleen died sooner, sometimes much sooner, than the controls. Obviously such a function is not evolved against carbon monoxide poisoning, but the authors suggest that it is a mechanism of real importance in all cases of anoxemia. Probably it comes into play in exercise and helps to increase the amount of oxygen available. This is the direct opposite of the old superstition that the absence of the spleen helped muscular exertion.

THE BLOOD SUGAR CONTENT IN MUSCULAR WORK. *G. C. E. Burger and J. C. Martens. Abstr. as follows from Klin. Wchnschr., 1924, no. 41, in München. med. Wchnschr., Oct. 24, 1924, vol. 71, p. 1519.*

It was shown that after work of rather short duration, even in skilled persons, a considerable lowering of the blood sugar may take place. It is therefore probable that the use of sugar during heavy muscular work can have a favorable effect by preventing a hypoglycemia.

INDUSTRIAL FATIGUE. (Harveian Lecture.) *C. S. Myers. Lancet, May 2, 1925, vol. 1, pp. 905–908.*

Industrial fatigue cannot be accurately defined, nor can electricity, but we may measure it. Reaction tests are not useful measures; tests of fatigability are better. Fatigue depends on skill as well as on effort; it is also controlled by the feeling of consciousness. When voluntary effort replaces intuitive behavior (skill), the expert worker falls to the level of the inexpert, disorder replaces order, and fatigue becomes manifest. The site of fatigue lies in the central nervous system. The unskilled and less productive worker who uses most effort tires first. Under industrial conditions the work curve is our best indication. The effort must be to improve the shape of this curve by improvements in environment, in posture, in rhythm of action, by the use of rest pauses, and through vocational selection. The shape of curve to aim at is one which rises from the commencement of work and does not fall away during the spell, during the day, or during the week. The way in which alterations affect the work curve indicates whether they are advantageous or disadvantageous. The mentality of the worker must always be considered; contentment and interest must replace resentment and boredom. One worker may be too intelligent for repetitive work, and another too dull for skilled work. Generally the dull worker prefers monotonous occupation. Change of pos-

ture rather than placid rest is often the best form of rest pause. Nervous inhibition may affect the work curve just as may physical fatigue; if this inhibition is removed, the work curve improves immediately, but lightening physical fatigue results in improvement to the work curve only after a lapse of weeks and maybe months. The lecturer throughout gives instances drawn from industrial research to justify his statements and to show the value to industrial production of studying the human factor.—E. L. C.

AN INVESTIGATION INTO SOME PROBLEMS OF POLISHING. *G. H. Miles and S. M. Bevington. Jour. Nat. Inst. Indust. Psychol., April, 1925, vol. 2, pp. 269–273.*

The investigation was made in two workshops in which about 150 girls were engaged in polishing certain articles by pressing them against revolving "buffs" (linen disks). The process is a dusty one; dust, grease, oil, and sand are deposited on the benches and to some extent on the workers. The investigators found that by designing a new form of bench, in which the girl's position in relation to her buff was changed, the dust was no longer thrown in her face. The new bench was much more comfortable than the stool formerly used, and reduced fatigue. Fatigue was likewise reduced by instituting a ten-minute break in the middle of the five-hour morning spell of work, and it caused a 5 per cent. increase in output.

The effort required in polishing was reduced by the introduction of an easier type of grasp and of fingering, and by the abolition of useless movements. Ultimately the new method led to a 7 per cent. improvement in output. Again, by introducing a larger size of buff, an improvement of 8 per cent. in output was effected.—H. M. V.

POSTURE AND WORK. *Pub. Health Nurse, April, 1925, vol. 17, pp. 206–207.*

This editorial comments briefly on several articles and publications dealing with posture. A work chair is reproduced which Dr. Emmons, Director of the Harvard Mercantile Health Work, believes is "the most satisfactory type of simple, substantial, inexpensive chair, generally useful, well adapted to office work even by 'billers' who must repeatedly turn from the files to the typewriter." This chair is practically the same as that described in THIS JOURNAL, 1921–1922, vol. 3, pp. 154–158.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

BONE CHANGES AFTER INJURY BY ELECTRIC CURRENT. *J. Palugyay. Abstr. as follows from Fortschr. a. d. Geb. d. Röntgenstrahlen, 1924, vol. 32, pp. 568–579, in Med. Science, April, 1925, vol. 12, p. 85.*

In this paper are given the description, photographs, and a number of

sketches showing the changes occurring in the phalanges of two cases injured by electric current. Details must be sought in the original, but the author strongly insists that the two cases indicate an intensely conservative method of treatment in opposition to the operative procedures recommended by some authors. In both cases, besides symptoms of inflammatory reaction and demarcation with sequestration of the necrosed portions of bone, there was an atrophy of the injured hand which must be regarded as Sudek's atrophy and sclerosis of the periosteum, of which the etiology is not yet clear. Stress is laid on the importance of arranging the radiologic procedure in this type of injury in such a way that the original damage is not aggravated.

WOMEN AND CHILDREN IN INDUSTRY

INFLUENCE OF INDUSTRY ON HEALTH OF WOMEN WORKERS. *G. Gellhorn. Nation's Health, March, 1925, vol. 7, pp. 165–168, 221–222.*

The injurious effect of industrial life on male workers, which was brought out during the war by military statistics, is even more marked among working women. Ceaseless fatigue, with its attendant ills and increase in accident rate; harm due to the occupation itself; the effect on the next generation which is indicated by the high rate of infant mortality among industrial workers—these are some of the factors which Dr. Gellhorn discusses in describing the overstrain which threatens the individual workers and, indirectly, the race.—E. S. C.

THE HEALTH OF THE WORKING CHILD. *N. Y. State Dept. Labor, Special Bull. No. 134, Dec., 1924, pp. 91.*

The Bureau of Women in Industry undertook this interesting study in regard to the working child's health. It concerns chiefly the relations between the kind of work and personal hygiene, and was made on 412 children in Manhattan continuation schools.

The children were largely American born but of foreign-born parents; 25 per cent. came from broken homes. Only children over 14½ years, who had worked six months, were studied. Most children had more than the minimum schooling requirement. Approximately 60 per cent. started work for economic reasons; others for dissatisfaction with school or because they felt that their education had been completed. First jobs were generally obtained through relatives or friends; later positions were filled increasingly by free employment bureaus. On an average the children were employed nine months and had two positions each; about 46 per cent. had held one position, over 25 per cent. had had three or more; one boy had had eleven. Most changes in positions were due to dissatisfaction with working conditions; almost one-third of the children left on the employers' initiative, slack seasons being rarely the cause of layoffs for boys but being responsible

for over one-fifth of dismissals among girls. Unemployment averaged a loss of one week's pay in fifteen for all the children; slightly over 50 per cent. of the total weeks of unemployment was caused by children of their own accord leaving one position before obtaining another, and 25 per cent. was due to slack season. Going to and from work took more than an hour a day for half the children. About one-eighth attended night school. Nearly one-fifth of the boys and 45 per cent. of the girls reported some home work. The "movies" were the chief recreation. Over one-third of the boys, but practically no girls, had regular gymnasium work.

Girls took chiefly factory work; boys predominated in office positions and as messengers. More than half the children were in small establishments. The median wage was $12.50, but the proportion of girls receiving less than $12 was higher than the proportion of boys. Boys had active, girls sedentary work; one-third of the boys were on their feet and one-fourth of the girls were sitting the entire workday. When on foot, boys walked a greater part of the time; girls stood. More than half the children had satisfactory chairs; one-fourth had inadequate seats, mostly stools. Weights exceeding 20 pounds were handled by 5 per cent. of the children. Nearly 20 per cent. worked in noisy surroundings, ten of these in noise so excessive as to drown ordinary conversation; in addition there were nine children under severe nerve strain from the driving nature of their work. Only one child had a dangerous job, but 11 per cent. had been injured during employment. Half the children worked forty-four hours or less; there were twenty-three children, however, who, contrary to the law, were employed more than forty-eight hours. For about 60 per cent. of the children, the lunch period was one hour; for 12 per cent., it was only half an hour. Lighting was generally good; but of those children who had to do very close eye work, one-third were provided with wholly inadequate lighting facilities. Two out of three children worked in well-ventilated plants; less than one-tenth worked where ventilation was unsatisfactory. Dust was a minor problem. Only 23 per cent. of the children worked in plants where the standard of industrial sanitation was rated as "good;" the conditions were least satisfactory for factory workers.

In studying the health of the children, almost three-fourths were found to have two or more defects; the defects averaged 2.4 per child. Only eighteen children had no physical defects. Approximate percentages of the most important defects were: visual, 31; dental, 33; enlarged tonsils, 12; thyroid enlargement (in girls only), 5; heart disease, 4; lung abnormality, 3 (suspicion of early tuberculosis, 1); overweight, 25, and underweight, 11; immaturity, with strength below average for boys, 10; endocrine deficiency, 9; defective posture (played an important part), 55; scoliosis, 13; flatfoot, 25. Of all the physical defects found among the children, 28 per cent. were judged to be directly accentuated by some requirement of work. Of all the children studied, 49 per cent. had some physical defect found to be intensified by the requirements of their jobs.

A description of twenty cases gives a graphic picture of the child in industry. Copies of the questionnaire forms used in the investigations are given in the appendix.—M. M.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

MEDICAL AND NURSING SERVICE IN INDUSTRIAL PLANTS. *O. Dowling. Am. Jour. Pub. Health, Feb., 1925, vol. 15, pp. 141–142.*

The physician's part is one which appeals to the human interests, and he will find his sphere of influence for good either great or small, depending on the amount of tact, insight into human nature, professional ability, and spirit of co-operation and understanding which he brings to bear.

The nurse in any industrial plant also is dependent on conditions for successful work, but not so responsible for their establishment as the physician. The nurse deals more specifically with the individual and the home. The author believes that, in addition to the care of the sick or "near sick" in the plant itself, the chief duties of the nurse are to visit the home and to give the physician information as to conditions which might be responsible for lessening the efficiency, physical vigor, or mental poise of the employee. His work includes the sanitary supervision of the plant and the town. His assistants in caring for the health of this community of 4,100 people are two nurses, one in the plant, and one in schools and homes.—E. S. C.

INDUSTRIAL HEALTH PROGRAM OF CANADIAN PAPER MILL. *F. L. McCarroll. Nation's Health, March, 1925, vol. 7, pp. 172–175.*

An account of the well-planned scheme for maintaining a high standard of health in the company town of the Spanish River Pulp & Paper Mills at Espanola, Canada, is given by the physician in charge.

PREVENTIVE DENTISTRY SERVICE FOR NEWSPAPER EMPLOYEES. *Nation's Health, March, 1925, vol. 7, pp. 194–195.*

The program for preventive dentistry in the comprehensive Employees' Benefit Plan worked out by the Chicago *Tribune* calls for regular examination of employees' mouths once at least every ninety days. This scheme has been in operation for over two years.—E. S. C.

GIVE MEDICAL SERVICE TO 5,000 GAS COMPANY EMPLOYEES. *Nation's Health, April, 1925, vol. 7, p. 268.*

The medical staff of the Peoples Gas, Light and Coke Company, Chicago, consists of three half-time physicians, a trained nurse, a visiting social service worker, a stenographer, and a clerk. Complete physical examinations are given before employment in the main office, and after three months in the plants where the turnover is rapid. Visits of employees are made as easy as possible, and the freedom with which they make use of the medical service indicates its success.—E. S. C.

REHABILITATION OF DISABLED EMPLOYEES

MEDICAL ATTENTION IN CONNECTION WITH REHABILITATION OF INJURED EMPLOYEES. *J. A. Parks. Boston Med. and Surg. Jour., Jan. 8, 1925, vol. 192, pp. 69–72.*

When the Compensation Act was first passed, little or no attention was given to the medical phase of it. Most of the states allowed medical attention for the first two weeks. At the end of that time, in most instances the employee was left on his own resources, and sometimes he went without any attention. In other instances he received such haphazard attention that it was of little or no benefit to him.

Insurance companies in Massachusetts have come to realize that the best medical service is the cheapest in the end. They have added to their staffs doctors who are experts in their various lines, and they have established clinics, first-aid rooms, and hospitals in connection with the various industrial plants throughout the Commonwealth. During the past year $2,250,000 was expended by insurers in Massachusetts for medical attention in the treatment of injured workmen.

The Industrial Accident Board has adopted a rule requesting a full medical report of all the treatment which has been given or is being given an injured man after a certain length of time. These reports are studied by the medical adviser of the Board to see what can be done to improve the treatment which is being given, in order to bring about rehabilitation more rapidly. After the study has been completed, recommendations are made to the insurance company. After the recommendations have been adopted, reports are made to the Board showing the progress of the case during the entire period of disability for which the man is receiving compensation.

The author stresses the importance of occupational therapy in conjunction with rehabilitation. He considers that "Occupational therapy, properly applied, is the medium through which the desired result can be accomplished. It is the link connecting the bedside treatment with job placement." He cites several cases in which employees have had remarkable recoveries from serious injuries as a result of expert medical attention. In concluding his paper, he recommends that "every state, which has not already done so, take up very seriously the medical phase of the [compensation] act and broaden its scope in every possible way."

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

FOURTH ANNUAL REPORT OF THE SECRETARY FOR MINES FOR THE YEAR ENDED 31 DECEMBER, 1924. *H. M. Stationery Office, 1925, pp. 197.*

A review is here given of the condition of the mining industry during the year. Only incidental references are made to matters concerning health. The work of the Miners' Welfare Fund is referred to; about £3,500,000 have accrued to this Fund since it commenced, of this sum over £2,500,000 have been allocated. Reference has previously been made in these columns to this Fund. Among the diseases which affect coal miners, some slight diminution has taken place in the number of cases of nystagmus, and also of beat hand and beat knee; but the diminution is hardly enough to encourage the hope that these diseases are definitely on the wane. Baths at pitheads are increasing in number all too slowly; the figures given show that less than 7,000 miners out of a total of nearly a million, who go underground daily, have an opportunity for washing before leaving work. The accidents show if anything a slight decrease on previous years; we wel-

come the new method of calculating accident rate per hundred thousand man-shifts worked, instead of per thousand men employed as heretofore. The new denominator used is a better index of the amount of exposure to risk.—E. L. C.

SAFETY IN MINES RESEARCH BOARD. THIRD ANNUAL REPORT FOR 1924. *H. M. Stationery Office, 1925, pp. 72.*

This report on research into safety in mines, which is rendered possible by grants made from the Miners' Welfare Fund, is divided into five parts. The first part describes a scheme of co-operation with the United States Bureau of Mines, established to avoid duplication, to arrange exchange of ideas and discussion of results, to enable important conclusions to be tested widely and to facilitate application of means for reducing hazards. Researches are to be distributed between the two organizations, there is to be an interchange of staff, investigators are to be kept in touch, and joint publication of collaboration is to be effected. Already Dr. Wheeler has visited the United States and Dr. Foster Bain has visited England.

The second part deals with experimental stations and in particular with a new one for large scale work which is to be established on high ground 2 miles from Buxton; smaller work is to proceed in laboratories adjoining the buildings of the University of Sheffield.

Part III summarizes research work carried on into (1) coal dust explosions, the chemical composition of coal as affecting inflammability, the effect of fineness of coal dust on inflammability, the effect of impurities, of the character of the atmosphere, of air currents, and the behavior of the propagation of flame; (2) firedamp explosions, due to ignition by sparks from picks, by lamp flames, by heated wires, and other matters; (3) spontaneous combustion of coal, in relation to spore exines, the constitution of cuticles, resins, natural ulmins, synthetic ulmins, and oxidation at low temperatures. Other researches concern electrical machinery and shot firing, explosives used, support of underground workings, mining appliances, and mine temperatures.

Part IV discusses the distribution of available moneys.

Part V is concerned with the activities of the Health Advisory Committee who report some apprehension that the increasing use of machine drills for driving roads in stone may cause silicosis among coal miners; they are watching the dust risk carefully. The occurrence of leptospiral jaundice at a Scotch colliery was closely investigated. The three diseases, beat knee, beat hand, and beat elbow, which occur particularly among miners, have been inquired into and reported on. The nutrition of miners has received careful consideration. Kata-thermometer research underground is being pursued. Miners' nystagmus is being further investigated. And an examination into the morbidity statistics of miners is being carried out.—E. L. C.

INTERNAL MIGRATION AND ITS EFFECTS UPON THE DEATH-RATES: WITH SPECIAL REFERENCE TO THE COUNTY OF ESSEX. *A. B. Hill. Med. Res. Council, Special Rep. Series No. 95. H. M. Stationery Office, 1925.*

The effect of industrialism on health

cannot be accurately evaluated without considering the results of migration from country to town. Such migration was a feature in Great Britain in the nineteenth century when the population was rapidly increasing and redistributing itself. This investigation is an intensive study of what took place in the agricultural county of Essex which is conterminous with the eastern side of London. The stream of migration affected females between the ages of 12 and 30, and males rather later, between the ages of 17 and 35; its direction was to London and its environs, but males tended also to go farther afield to other industrial centers. The migrants were the energetic and healthy, hence mortality among those left in the country was unduly high at the ages named; while the town death rates at these ages were correspondingly lowered. These modifications of the death rates are particularly worked out for phthisis. The male migrants move to outdoor occupations in the towns where their earnings are high relative to rural wages. Females move to domestic service of high-class type. Evidence that migrants fall ill and return home to die was lacking; they seem rather to do well and draw friends and relatives to join them.

A study of rural dietaries displays the existence at times of actual deficiency, most pronounced where there is a young family; nevertheless malnutrition is prevented by a plentiful supply of vitamins and sunlight.

The investigation is a solid and painstaking contribution to the understanding of social conditions. It bases on a foundation of facts what has often been suspected and as often discussed. Already internal migration has slowed down; with increased facilities for transport the stream in the future may advantageously be reversed.--E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

EXPERIMENTAL STUDIES ON THE EFFECT OF HEAVY GASES ON THE ORGANISM: XXXVI. ACETONE. *E. Kagan. Arch. f. Hyg., 1924, vol. 94, pp. 41–53.*

Cats were used as experimental animals. They were placed in glass cages through which air was drawn. The air had previously been passed through acetone, and the acetone was weighed before and after the experiment.

Effects of acute and chronic exposures were studied. In the case of acute poisoning the first symptoms appear with doses of 8 to 10 mg. The symptoms include irritation of all the visible mucous membranes. With larger doses—20 to 50 mg.—salivation becomes marked, and the animal shakes its head. With all doses above 10 mg., by the end of one-half hour symptoms of numbness and drowsiness appear, but with doses of 80 to 100 mg. this stage is not found. On the contrary, there is great excitement followed by cerebral stimulation—dizziness, inco-ordinated movements;

the animal is shaky and finally is unable to stand and must remain lying on its side. At this time tonic and clonic convulsions occur, even though the narcosis be deep. Chronic exposures were made with smaller doses—3 to 5 mg.—without visible harm, but they did bring out the point that the animals became more tolerant to the drug.

The author breathed air that had passed through a 10 per cent. solution of acetone, but on account of a burning sensation in his throat was not able to continue for more than five minutes.

The author will later attempt to correlate his findings with the dangers to which acetone workers are exposed.—H. E. H.

HYGIENE IN TYPE FOUNDRIES AND EXPERIMENTAL ANTIMONY POISONING. *A. Seitz. Arch. f. Hyg., 1924, vol. 94, pp. 284–297.*

In type foundries the former danger due to steaming acrolein is no longer a menace. The presence of carbon monoxide and gaseous hydrocarbons could not be demonstrated by the author. Type foundries no longer use a metal containing arsenic as an impurity, hence gaseous arsenic compounds formed during type molding are not to be feared. It seems therefore that the poor health conditions of the workers, particularly of the women, are due chiefly to the heated and stagnant atmosphere in the buildings, and to the nauseating gaseous products formed. Another important factor is gastro-intestinal poisoning due to antimony, which next to lead is one of the chief components of the dust present in the foundry.

The effect of antimony poisoning on experimental animals was investigated. The blood picture of these animals showed changes similar to those obtained in the blood picture of workers in type foundries. The essential points in these changes were: a reduction of neutrophils, an increase in mononuclears, chiefly small lymphocytes, and an initial decrease in red blood cells, followed by a subsequent increase.

If one arranges the workers connected with type foundries in groups, one arrives at the conclusion that type founders themselves do not show the highest sickness rate from lead poisoning—15.7 per cent. as compared with adjusters, who show a rate of 23.3 per cent. Other diseases also occur less frequently in the type founders than in the other groups connected with printing. Women seem to suffer more than men, and this is important since it causes arrest in development of the fetus.

THE TEMPORARY APPEARANCE OF BASOPHILIC GRANULATION IN LEAD POISONING. *A. Trautmann. Arch. f. Hyg., 1924, vol. 94, pp. 298–305.*

Since stippling is the earliest sign of lead poisoning, it was taken as the criterion. It was found that workers in the painting trades had the highest incidence rate. Of 550 workers examined, 158, or 28.7 per cent., showed stippling.

Painters may not show it for five or six years and typesetters for ten years, but in female powder makers (*Puderinnen*) it may appear as early as the eighth day. The amount of stippling and the number of people affected increase with the length of exposure, but in two out of eighteen persons who

had worked one-half year there was no sign of blood changes.—H. E. H.

THE QUESTION OF THE VALUE OF HEMATOLOGIC DIAGNOSIS IN LEAD POISONING. *E. W. Koch. Arch. f. Hyg., 1924, vol. 94, pp. 306–316.*

The lead line at the gums, the peculiar coloration due to lead poisoning, the separation of hematoporphyrin, and basophilic granulation of red blood corpuscles are, according to P. Schmidt, the four objective cardinal symptoms of a beginning lead poisoning. In order to diagnose lead poisoning early, the examination of the blood for basophilic granulation is of inestimable value as an aid in diagnosis.

A scheme for examination of workers in those lead industries highly dangerous from the standpoint of their effect on the health of these workers would include an initial examination of the workers before their entrance into the industry, weekly examinations during the course of the first month of work, and regular monthly examinations during their entire stay in this employment.

A standard staining method, especially adapted for the detection of basophilic granulation, is given by the author—fifteen minutes' hardening in concentrated alcohol, two minutes' coloring with azur II, Giemsa, and three times washed off.

The appearance of polychromatous erythrocytes is as important a sign as the appearance of basophilic granulation in the blood picture. These two deviations from the normal should be designated under the common term "granulo-polychromatous." One hundred granulo-polychromacytes out of one million red blood corpuscles are suspicious; 500 are diagnostic.

The author insists on the urgent necessity of routine blood examinations on workers in lead industries of the danger class throughout the course of their stay in the work.

ARE LEAD FUMES FORMED IN DANGEROUS AMOUNTS DURING SOLDERING? *H. Fischer. Arch. f. Hyg., 1924, vol. 94, pp. 342–346.*

Although lead oxide particles are formed during soldering, the amount is not large enough to subject the smelter to any greater danger than those in other trades connected with lead—*i.e.*, typesetters. Practically there is no danger from the inspiration of lead oxide.—H. E. H.

LEAD MENINGO-ENCEPHALOPATHY. *C. V. Weller. Abstr. as follows from Ann. Clin. Med., March, 1925, vol. 3, p. 604, in Jour. Am. Med. Assn., May 16, 1925, vol. 84, p. 1524.*

Weller directs attention to the etiologic rôle of lead in a form of meningo-encephalopathy which exhibits a large variety of clinical signs and symptoms. The convulsive type particularly, occurring in adults but also frequently found in children, quite apart from the usually recognized lead hazards, is thought to be of great clinical importance.—K. R. D.

PERNICIOUS ANEMIA FROM RADIUM. *Weil and Lacassagne. Abstr. as follows from Bull. et mém. Soc. méd. d. hôp. de Paris, April 3, 1925, vol. 49, p. 535, in Jour. Am. Med. Assn., June 6, 1925, vol. 84, p. 1785.*

Weil and Lacassagne observed a case in a man, aged 40, working for

four years in the manufacture of radioactive preparations from thorium. Death followed a five months' illness.—K. R. D.

POSSIBLE TIN HYDRIDE POISONING. *G. Joachimoglu and F. Paneth. München. med. Wchnschr., Nov. 21, 1924, vol. 71, pp. 1647–1648.*

It had been noticed that after eating food which had been in tinned vessels a definite group of symptoms developed: headache, stomachache, followed in a few hours by vomiting and diarrhea. The symptoms clear up in three or four days.

The authors criticize the viewpoints of Zellner and Vaubel. They show that Zellner's explanation, which makes arsenic the responsible agent, is unlikely. They also demonstrate that it is difficult to produce tin hydride, thus attempting to exclude Vaubel's explanation. They conclude that the public need not be alarmed about the matter.

Vaubel replies that whatever the explanation, the fact remains that people have become ill after eating food from tinned vessels. He says that in the presence of acid tin hydride is easily formed and the symptoms noted are those of tin hydride poisoning.—H. E. H.

THE POSSIBLE RELATION OF COPPER TO DISEASE AMONG THE KOREAN PEOPLE. *R. G. Mills. Jour. Am. Med. Assn., May 2, 1925, vol. 84, pp. 1326–1327.*

Mallory's recent papers on the relation between chronic copper poisoning and hemochromatosis led Mills to the publication of the following observations.

Among the Korean people brass is the universal material out of which they manufacture the rice and other food bowls, spoons, and some of the kitchen utensils. Wine bottles, some of the stills for making fermented liquors, and a form of chafing dish are also made of this substance. Food is served in these vessels, or, in some instances, cooked in them, and may be allowed to remain there a longer or shorter period of time. Workingmen usually carry their lunch to the field in such bowls. Any food left over serves for the evening meal or is brought back home. In the kitchen, remnants are frequently left in the bowls from one meal to the next.

The nature of some of the foods is such that they would probably exert a solvent action on the brass. A native salt pickle, similar to sauerkraut, contains a considerable quantity of organic acid. Vinegar is used to a slight extent. Meats, fish, sesame oil, and other tried and greasy foods form a reasonable portion of the daily menu.

During the consumption of the food, every time a brass spoon clicks against a brass dish a minimal amount of the metal is scratched off and is swallowed with the food.

Children are given more or less solid food within a few days after birth, and the constant ingestion of copper continues until death.

The effect of copper on spontaneous tuberculosis appears to be negligible, the incidence being about as high as in other countries similarly situated.

The people themselves feel that the use of brass utensils is in some way a protection against disease. A family may be so reduced financially that it is compelled to sell off most of its posses-

sions, but the brass dishes are the last to go. Bowls of glazed earthenware and spoons of iron may be purchased in the markets for a small fraction of the cost of the brass ones, but the people cling persistently to the time-honored custom. When asked for an explanation, they have repeatedly said that brass bowls protect them from epidemic disease.

A study of the conditions in Korea surrounding those who work in brass showed that conditions were anything but sanitary, but most of the lathe work was done in semiopen rooms, and the metal often melted and poured in the open air. Eating with unwashed hands was the usual thing. The workmen themselves did not appear to be suffering from any symptoms of brass poisoning, and they were unaware of any disease that was common to the trade. There was no evidence, therefore, that these workers were any more affected by any form of disease than the general population.

In a series of almost 100 necropsies on Koreans, no disturbance of pigmentation of the internal organs was noted. The pancreas was especially studied for other reasons, but no changes of this sort were observed. In Sprunt's series of sixty-three cases of hemochromatosis, fifty were affected with diabetes of the bronzed type. Among the Koreans the bronzing might be overlooked, but the incidence of diabetes in Korea is definitely low. If the ingestion of copper were responsible for cases of diabetes, the incidence should be infinitely greater than in the United States instead of definitely less.

The deposition of pigment, according to Opie, gives rise to degeneration of the liver cells. Cirrhosis of the liver is a common disease among the Koreans. Excluding the injury produced by *Clonorchis*, and the usually assigned causes of the disease, there still remains a considerable number of cases of unknown etiology. These cases are commonly in young persons, especially girls, below the age of 15 years. It is possible that chronic copper intoxication may be the explanation.—K. R. D.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

PATHOGENESIS OF "INTERNAL" ANTHRAX. *G. Sanarelli. Abstr. as follows from Ann. de l'Inst. Pasteur, March, 1925, vol. 39, p. 209, in Jour. Am. Med. Assn., June 6, 1925, vol. 84, p. 1785.*

Sanarelli says that the anthrax spores in the alimentary canal of animals are unaffected by the gastric juice, but they are unable to proliferate in the intestinal juices. They cannot proliferate in the presence of colon bacilli or their secretion products. "Intestinal mycosis" is thus excluded. By injection in a spray through the nose, definite doses of anthrax germs may be introduced into the lungs without injury to skin or mucosa. With excessive doses (100,000 spores), the spores proliferate, invade the blood, and cause septicemia. In sublethal doses, they lurk, latent, in various

organs but may be influenced to proliferate and produce the general infection called "internal" anthrax by the introduction of substances capable of producing necrotic foci. This can best be accomplished by provocative injections into the spleen twenty-four hours after injection of the spores into the lungs. The lesions of the digestive apparatus in anthrax, as seen at necropsy, are of blood-borne origin. Such lesions, particularly in Peyer's patches, often lead to hemorrhagic necrosis. Six colored plates illustrate the findings in this research.—K. R. D.

SYPHILIS IN GLASS-BLOWERS. *F. Jacoby. Abstr. as follows from München. med. Wchnschr., April 10, 1925, vol. 72, p. 589, in Jour. Am. Med. Assn., June 6, 1925, vol. 84, p. 1790.*

Jacoby describes oral syphilitic infection in glass blowers.—K. R. D.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

ECZEMAS OF BREAD BAKERS AND CONFECTIONERS. *R. P. White. Abstr. as follows from Brit. Jour. Dermat. and Syph., April, 1925, vol. 37, p. 163, in Jour. Am. Med. Assn., May 16, 1925, vol. 84, p. 1529.*

White is convinced that there is no eruption specific to, or distinctive of these industries, unless eczema can be so labeled. Experiments and the clinical evidence strongly suggest that the majority of these cutaneous disorders are incidents rather than consequences of the work.—K. R. D.

IRRITATIONS OF THE SKIN DUE TO INDUSTRIAL CAUSES. *C. G. Lane. Nation's Health, June, 1925, vol. 7, pp. 402–404.*

From a recent study of 7,000 cases of skin disease from the Massachusetts General Hospital, Lane is led to believe that 9 to 10 per cent. of all cases of skin disease are industrial in origin. The list of occupations affected includes the following groups of workers: housewives, maids, cooks, dishwashers, janitors, shoe workers, dye workers, painters, rubber workers, candy workers, nurses, machinists, photographers, silver polishers, packers (using hay, straw, etc.), bakers, tanners, cement workers, nickel-platers, tobacco workers, longshoremen, bleachers, upholsterers, waitresses, gardeners, necropsy room attendants, millers, acetylene workers, labelers, lumbermen, farmers, wool workers, and printers.—K. R. D.

DERMATOSIS TRAUMATICUS AND SKIN SENSITISATION. *R. P. White. Med. Press, June 17, 1925, pp. 477–481.*

The author holds that sensitization does not take a large share in the genesis, or persistence, of trade eczemas, the eruptions of which are for the most part local and do not cause any reaction at distant foci. The rash only reappears when the irritant is renewed. Urticaria is a sensitization phenomena, which may be due to protein toxemia. The commonest reaction to external agents is eczema, which disappears when the agent is withdrawn. External irritants may prove serious in persons who possess protein sensitiveness (anaphylaxis). The vast majority of trade eruptions are due to direct mechanical,

or chemical, injury or irritation. The eruption caused may be an epithelioma, erythema, folliculitis, ulcer, or eczema.—E. L. C.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

THE EFFECT OF MENTAL WORK ON ENERGY EXPENDITURE. *H. Ilzhöfer. Arch. f. Hyg., 1924, vol. 94, pp. 317–328.*

As determined on the Krogh apparatus, mental work has no apparent effect on the energy requirement of the body.—H. E. H.

EXPERIMENTS ON NUTRITION IN MENTAL AND PHYSICAL WORK. *F. Potz. Arch. f. Hyg., 1924, vol. 94, pp. 329–341.*

In experiments performed on himself, Potz shows that with but slight amounts of fat, no food of animal origin at all, and a minimum of calories, perfect health can be maintained though physical and mental work are performed.—H. E. H.

OBSERVATIONS ON BLOOD PRESSURE IN RELATION TO WORK. *H. Griesbach. Arch. f. Hyg., 1924, vol. 94, pp. 73–87.*

Systolic blood pressures were taken in part with v. Recklinghausen's apparatus and in part with the Riva-Rocci and Braun-Melsungen machine. With fatigue due to mental work, blood pressure falls; if there is a psychic stimulation along with the mental labor, however, as in an examination, the blood pressure rises markedly. Slight physical work causes a moderate rise in blood pressure, which is reduced by training. Tiredness and sweating bring about a fall in blood pressure.

A blood pressure curve is reproduced which was taken on a man doing hard labor. There are two facts to be noted: (1) The blood pressure rises during the morning, falls during the midday pause, and then rises to a still higher level until work is ended. (2) The succeeding days of the week show higher curves, so that the Sunday blood pressures are the lowest and those for Saturday the highest. The Sunday blood pressures did not show the fall during midday but had a single rise and fall.

Possible toxic effects on blood pressure were studied on lead and tobacco workers. The lead workers (minium burners) show higher blood pressures than workers in other trades. Female cigarette workers have in some cases approximately normal blood pressures and in others the pressures are somewhat raised.

It is interesting to note that when the heavy worker who showed the daily increase in blood pressure throughout the week was given Animasa (a drug to reduce blood pressure), his curve for succeeding days did not rise but all reached approximately the same maxima.—H. E. H.

A CONTRIBUTION TO THE THEORY OF THE ACTION OF NITROBENZOL AND ANILINE ON THE BLOOD. *W. Heubner and R. Meier. Zentralbl. f. Gewerbehyg., Sept., 1924, N. S. vol. 1, pp. 39–40.*

The basis of the action of nitrobenzol and aniline lies in the change of oxyhemoglobin to methemoglobin. The end-products of experiments *in vitro* and *in vivo* are the same, as aminophenol appears in both. Similar substances have been recently investigated by Lipschitz and Ellinger, who found that methemoglobin was formed. Phenylhydroxylamine is formed in both cases from substances of higher oxygen content by reduction, or from substances of lower oxygen content by oxidation. One can therefore assume that both nitrobenzol and aniline were transformed into the simpler phenylhydroxylamine and the latter caused the formation of methemoglobin. Therefore the authors have examined a series of substances which react to form methemoglobin; they all have in common the property of reacting with oxyhemoglobin; and the stronger their capacity to react with hemoglobin, the easier are they oxidized. First, most labile, in the series stands phenylhydroxylamine; then comes aminophenol; followed by hydrazobenzol; and last, the stabile azobenzol and azoxybenzol. These substances, however, do not react at all with hemoglobin, *i.e.*, in an atmosphere of hydrogen they form no methemoglobin. On the other hand, oxidating substances like potassium ferrocyanide are able to react thus. In the reaction of the aromatic bodies in the formation of methemoglobin, more oxygen is consumed than is necessary simply for the formation of methemoglobin; therefore this extra oxygen must have been used for the oxidation of phenylhydroxylamine.

The authors conclude that in the presence of oxyhemoglobin, phenylhydroxylamine is oxidized—the oxygen of this oxidized form is very reactive and causes the formation of methemoglobin. This method of the formation of methemoglobin also holds for arsine and phosphine.—H. E. H.

EFFECTS OF EXTERNAL HEAT ON HUMAN BODY. *R. Pemberton. Abstr. as follows from Am. Jour. Med. Sciences, April, 1925, vol. 169, p. 485, in Jour. Am. Med. Assn., July 4, 1925, vol. 85, p. 63.*

Pemberton has for some years been studying the changes accruing from exposure of the body to external heat in the form of radiation from electric lamps, the so-called "bake." Such exposure results in a heightened blood flow and increased metabolism and in the elimination of acids, chiefly carbon dioxide, which escapes through the lungs, urine, and sweat in the order of magnitude named. This leaves an excess of alkali in the blood which then changes its reaction, becoming more alkaline. In the compensatory effort to meet this situation, the excess of alkali is eliminated through the sweat and urine. If carried to extremes, tetany may result. The available evidence indicates that part of the benefit of the sweat process in some forms of nephritis is due to loss of acid substances from the body, with consequent benefit to the acidosis frequently accompanying renal disease. —K. R. D.

ASSOCIATION OF COPPER WITH SUBSTANCES CONTAINING FAT-SOLUBLE A VITAMIN. *J. S. McHargue. Abstr. as follows from Am. Jour. Physiol., May, 1925, vol. 72, p. 583, in Jour. Am. Med. Assn., July 11, 1925, vol. 85, p. 143.*

The wide distribution of small amounts of copper in plant and animal tissues and its greatest concentration occurring in vital organs leads McHargue to infer important biologic functions for this element in the normal metabolism of plants and animals.—K. R. D.

REVERY AND INDUSTRIAL FATIGUE. *E. Mayo. Jour. Personnel Res., Dec., 1924, vol. 3, pp. 273–281.*

"The mental attitude of the man on the job is sometimes more potent in determining output than relative machine-speeds, bonus incentives, or careful vocational selection methods. Striking experimental proof of the effects of mental attitude, perhaps due in part to postural fatigue, on labor turnover and output has been found in a Philadelphia textile mill."

The summary of the author's findings is as follows:

1. As ordinarily carried on, the operation of spinning mules tends to produce physical postural fatigue. Its relative monotony also induces dispersed thinking and states of revery which are apt to be pessimistic.

2. The introduction of rest pauses relieves this condition and greatly increases production by (*a*) restoring normal circulation and relieving postural fatigue, and (*b*) effectively interrupting pessimistic revery.

3. In the instance described, the rest pauses are chiefly effective because they eliminate pessimistic revery.

4. The rest pauses must be introduced and accompanied by instruction in the technic of relaxation.

5. The rest pauses are more effective when of regular or assured incidence.

6. By these means, in the instance described, a high labor turnover ("temperamental" in character) was got rid of, productive efficiency increased and the general morale greatly improved.

7. Many types of factory operation resemble spinning in that they encourage states of revery mentally harmful to the individual. Some modification of the present technic would be capable of effective application in such instances.

RESTS—AUTHORIZED AND UNAUTHORIZED. *R. B. Hersey. Jour. Personnel Res., June, 1925, vol. 4, pp. 37–45.*

The author offers the following tentative conclusions:

1. In all exacting tasks or monotonous operations, the workers take rests, often very inefficiently; so that the question is not whether time shall be spent in resting, but rather, how to regulate and utilize most effectively the time so spent.

2. The present methods of voluntary utilization of the rest period on the part of workers cannot be taken as a guide to the most effective methods of relaxation.

3. Given quiet and proper facilities, and instruction in the art of complete relaxation, there are probably few workers who could not learn to get to sleep during ten minutes of a fifteen-minute rest period.

4. In the introduction of rests into a plant, the management should keep before its eyes the ideal of providing abundant facilities for complete relaxation and should instruct the workers in its benefits rather than leave the matter to the workers themselves. Complete relaxation should not be demanded, in view of possible objections from the workers, but should be made the logical and natural method. Of course, there are many industrial plants whose facilities or occupational conditions will not permit such a complete form of relaxation; but even they will benefit by keeping in mind the value of maximum relaxation and giving facilities for it wherever possible.

5. Of course, ideal rests cannot be expected to solve all the employers' problems of labor unrest. They are, however, of comparable importance with proper working conditions and an assured, steady and adequate wage. No matter what wages he may pay, the employer who does not authorize rests will pay for those authorized by his competitor.

SALINE DRINK IN INDUSTRIAL FATIGUE. *R. J. W. Oswald. Lancet, June 27, 1925, vol. 1, pp. 1369–1370.*

The result of introducing a saline drink for stokers in the retort houses of a gas works is reported. The drink was compounded as follows: 120 gm. potassium chloride and 180 gm. sodium chloride per liter of water; 2.5 liters of this stock solution added to 213.3 liters (47 gallons) of water. Since the introduction of this drink, cramp has been eliminated and a greater sense of well-being obtained at the end of each shift; the sick rate also has been reduced.—E. L. C.

WOMEN AND CHILDREN IN INDUSTRY

EFFECT OF COMPULSORY WORK DURING GESTATION ON MOTHER AND YOUNG. *J. R. Slonaker and D. L. Robertson. Abstr. as follows from Am. Jour. Physiol., May, 1925, vol. 72, p. 502, in Jour. Am. Med. Assn., July 11, 1925, vol. 85, p. 143.*

The general conclusions drawn by Slonaker and Robertson are that forced exercise given rats during gestation sufficient to cause a marked degree of fatigue tends to cause resorption of young, abortion, pseudopregnancy or death of the adults, a reduction of the number of young born, and a lack of normal lactation.—K. R. D.

INFLUENCE OF FACTORY WORK ON PARTURITION. *Lancet, Aug. 15, 1925, vol. 2, p. 352.*

A report by Dr. Hirsch of Berlin is here noticed, which concerns the effect of factory work on pregnancy, birth, and the postpartum period. Textile operatives are mainly considered. The ratio of miscarriages among women employed at spinning and weaving was as 16 to 1, compared with 6 to 1 among women not in factory employment, while the number of stillbirths was double the average for the whole country. Only 30 per cent. of births among the operatives were normal which is attributed to narrowness of the pelvis consequent upon women beginning factory work while the body is still growing. These female operatives are worn out at the age of 40. Certain ameliorative proposals were adopted by the Berlin Medical Society to whom the communication was made.—E. L. C.

THE RECOMMENDATIONS OF THE SHANGHAI CHILD LABOUR COMMISSION. *A. Anderson. Internat. Labour Rev., May, 1925, vol. 11, pp. 665–681.*

The writer was summoned to China in order to help forward the inauguration of Regulations intended to improve conditions of child labor. She tells somewhat of the course of events and the condition of things which she found. The story is reminiscent of the development of industrial conditions in Europe a hundred years ago. But certain matters are peculiar to China; thus there is no government with power to enforce its decrees throughout the country. Hence there is as yet no regulation of labor in any part of China. No law in any community, possibly least of all in China, can be enforced against the wishes of the majority of the people. Much has first to be done to spread knowledge as to the value of labor legislation. Nevertheless as

factories and mills are growing, there is also growing a number of enlightened manufacturers ready to benefit by experience gained in other countries. Three fundamental safeguards are aimed at: (*a*) no industrial employment under 12 years of age; (*b*) one day's rest in seven; (*c*) safeguarding health by shortening hours, improving sanitary conditions, and installing safety devices. Industrialism has gained its footing in China through Shanghai, and the first steps must be taken there. But obedience to any regulations will not follow unless specially trained inspectors are appointed with powers adequate for enforcement.—E. L. C.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

FUMIGATION WITH HYDROGEN CYANIDE. *W. G. Liston. Jour. Soc. Chem. Indust., April 10, 1925, vol. 44, pp. 367–371.*

The use and development of hydrogen cyanide gas as a fumigating agent for killing rats, bugs, fleas, mosquitoes, as well as insects infesting trees and foliage, is discussed in detail. Various methods for generating gas are described. All involve the mixing of a cyanide salt, such as sodium cyanide, either dry or in solution, with strong sulphuric acid.

A new apparatus in which the amount of hydrogen cyanide liberated is under control at all times is described. This is intended more particularly for use in closed spaces, such as ships and buildings, rather than for trees in orchards, and is equipped with a blower by means of which the hydrogen cyanide is mixed with air and blown into the room.

Concentrations of at least 20 parts per 100,000 parts of air should be maintained for half an hour or more. This concentration is fatal to vermin and very dangerous to man, so that extreme caution must be used in entering any closed space which is under hydrogen cyanide treatment.

The author's new apparatus for generating hydrogen cyanide includes a simple equipment for aspirating a test sample of the hydrogen cyanide air mixture through caustic soda solution containing potassium iodide. The hydrogen cyanide is fixed as sodium cyanide and the amount is subsequently determined by titrating with silver nitrate.—P. D.

FUNDAMENTALS OF VENTILATION. *E. R. Hayhurst and N. C. Dysart. Am. Jour. Pub. Health, April, 1925, vol. 15, pp. 367–370.*

This is a review and discussion, particularly of recent work on window ventilation, fan ventilation, air replacement rates in ventilation, and recirculation in ventilation.—P. D.

VENTILATION OF DYEHOUSES. *C. L. Hubbard. Abstr. as follows from Textile World, 1924, vol. 66, pp. 3297–3301, in Chem. Abstr., April 10, 1925, vol. 19, p. 1200.*

This is a discussion of the ventilation of dyehouses and wet finishing rooms; the use of hot air, the practical application of principles and engineering calculations.—P. D.

VENTILATION AND HUMIDIFICATION IN COTTON MILLS IN INDIA. *Lancet, April 18, 1925, vol. 1, pp. 850–851.*

A note is here given on an inquiry made in India by T. Maloney into the use of artificial humidification in cotton mills in India. No definite proof was found that health is always adversely affected, but the physique of the average cotton operative is lower than that of workers of similar castes and wage-earning capacity in other trades. An increase in the cooling power of the air in the mills is recommended, and a standard of 11 (millicalories per square centimeter) as measured by the wet katathermometer is suggested. The proposal is also made that artificial humidification should cease at a dry bulb temperature of 85°F. The conclusions of the report will probably be adopted by the government of India in the near future.—E. L. C.

THE FUNCTION OF OZONE IN VENTILATION. *F. E. Hartman. Am. School Board Jour., May, 1925, pp. 7.*

The author reviews the history of ventilation, the carbon dioxide theory, the organic toxin theory (on which our present ventilation requirements are based), the air-borne infection theory, and finally the modern theory of ventilation, which depends on the physical properties of the air.

The functions of ozone in ventilation as a deodorant and as a chemical rejuvenating agent for mechanically treated air are clearly brought out; its economic possibilities in saving fuel through recirculation of the air are also discussed.—C. P. Y.

MODERN TREND IN APPLYING OZONE TO COLD STORAGE. *F. E. Hartman. Abstr. of Paper Read at Twelfth Western Meeting of Am. Soc. Refrigerating Eng., Milwaukee, Wis., May, 1925, pp. 6.*

In this paper the function of ozone in cold storage as an aerial scavenger is discussed, with past and present practices in the equipment employed. The author emphasizes the necessity of uniform ozone production and shows a typical commercial unit and the layout of a recent installation in a modern warehouse.—C. P. Y.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

PREVENTIVE MEDICINE IN INDUSTRY. *F. L. Rector. Nation's Health, May, 1925, vol. 7, p. 331.*

The physical appraisal of a group of textile mill workers employed on industrial processes resulted in a 14 per cent. increase of production by 6 per cent. less workers than were employed previously. Other interesting figures given by the author in this account of health work in industry support his theory that there is less tuberculosis among industrial workers than there is in the general population of similar groups—perhaps because workmen tend to find their own physical levels.—E. S. C.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

WAGES AND HOURS OF LABOR IN THE PAPER AND PULP INDUSTRY, 1923. *U. S. Bur. Labor Statistics, Bull. No. 365, Jan., 1925, pp. 142.*

WAGES AND HOURS OF LABOR IN THE HOSIERY AND UNDERWEAR INDUSTRY: 1907–1924. *Ibid., Bull. No. 376, March, 1925, pp. 59.*

WAGES AND HOURS OF LABOR IN WOOLEN AND WORSTED GOODS MANUFACTURING, 1924. *Ibid., Bull. No. 377, March, 1925, pp. 36.*

WAGES AND HOURS OF LABOR IN THE SLAUGHTERING AND MEAT-PACKING INDUSTRY, 1923. *Ibid., Bull. No. 373, May, 1925, pp. 117.*

WAGES AND HOURS OF LABOR IN THE IRON AND STEEL INDUSTRY: 1907 TO 1924. *Ibid., Bull. No. 381, May, 1925, pp. 163.*

WAGES AND HOURS OF LABOR IN THE MEN'S CLOTHING INDUSTRY: 1911 TO 1924. *Ibid., Bull. No. 387, May, 1925, pp. 51.*

LABOR CONDITIONS IN THE SHOE INDUSTRY IN MASSACHUSETTS: 1920–1924. *R. S. Billups and P. L. Jones. U. S. Bur. Labor Statistics, Bull. No. 384, March, 1925, pp. 46.*

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

PERFORMANCE TESTS OF INTELLIGENCE. *F. Gaw. Indust. Fatigue Res. Board, Rep. No. 31, pp. 45. H. M. Stationery Office, 1925.*

The need for using performance tests in industry is discussed and followed by a short historical account of the development of such tests. The types of tests in use are dealt with and then a description is given of a series of fourteen tests recommended for practical use. Each test is simply and clearly described, and most of them are illustrated. The method of using them is set forth and a comparison is made of the results with further estimates of intelligence, and with tests of mechanical ability and constructive ability. The report is a textbook for the use of investigators. It does not give any account of research carried out. Its value to those who decide to use performance tests is hard to overestimate.—E. L. C.

HOW PSYCHOLOGICAL TESTS ARE USED IN EMPLOYING. *D. Laird. Nation's Health, April, 1925, vol. 7, p. 235.*

Various types of psychologic tests used in employment procedure are: (1) trials at the work; (2) miniature occupations; (3) essential capacities, that is, testing the capacities demanded by the work; (4) the empirical method, or random tests that have been experimented with; and (5) trade tests, which measure the applicant's knowledge of the work in hand.—E. S. C.

THE VOCATIONAL SELECTION OF WEAVERS. *W. Spielman. Jour. Nat. Inst. Indust. Psychol., April, 1925, vol. 2, pp. 256–261.*

A number of tests were devised for the selection of tapestry weavers. One group, relating to observation, included tests for discrimination of pattern, memory of pattern, discrimination of thickness of yarn, and ability to attend to several objects simultaneously. The other group, relating to speed, included tests for threading eyelets, for twisting a screw (a similar movement to that required in twisting warps), and for foresight in planning (tested by traversing a maze). These tests were applied to a group of thirteen weavers whose occupational abilities were unknown to the investigator, and the correlation coefficient of all the tests with the manager's ranking was $+0.77 \pm 0.07$. Individual tests gave correlations of $+0.38$ to $+0.73$, so it is thought that the tests should prove of great value in the selection of weavers. They should not form the sole method of selection, however; they should supplement, rather than supplant, the personal interview.—H. M. V.

VOCATIONAL GUIDANCE IN GERMANY. *Internat. Labour Rev., April, 1925, vol. 11, pp. 526–541.*

An account is here given of the position of vocational guidance in Germany where even before the war attention was being devoted to the subject. The reduction in the incomes of the middle classes after the war, by leading them to encourage their children to enter industrial occupations rather than the liberal professions, seems to have given an impetus to the movement. Legislation in 1922 provided that employment exchanges should be empowered to extend their activities to include vocational guidance and the placing of apprentices. The Act defines the powers of federal employment boards who may formulate general principles for vocational guidance after consulting trade representatives and economic associations. Officials of employment exchanges are to give advice about institutions for vocational training and they must maintain relations with the schools in their districts. Vocational guidance and the placing of apprentices are to be combined as far as possible. Advisory committees exist including employers and workers as well as experts on vocational guidance, school masters and welfare workers, and doctors and psychologists. Vocational counselors are employed with expert knowledge, and provision must be made for training such men. Supreme state authorities may compel communes to take measures for organizing vocational guidance on the lines laid down by law. A fairly extensive organization is now in existence; thus, there were 592 offices in which vocational guidance was given in 1922. For the most part the advice is given in the afternoon when would-be applicants are free. The total number of young persons who applied was over 200,000; 57 per cent. were boys and 43 per cent. girls. There were 150 male applicants for apprenticeship to every 100 vacancies, and 200 female applicants to every 100 vacancies. Out of every 100 applicants, 43 were found occupations; 92 per cent. of these were placed as apprentices, and 8 per cent. were sent to schools for vocational training. More than one-third had a preference

for metal working and engineering trades, very few for agriculture, still fewer for mining, and practically none at all for the textile trades, or for becoming mechanics or chauffeurs.

The traditional group of occupations, manual and intellectual, has been found ineffective. Psychic and sensorimotor faculties must be considered; attention; memory; motor, sensitive, sensory faculties; quickness of observation, of combination, of adaptation, and of emotional reaction. Ability tests are found of real, but limited, value. An essential factor is the co-operation of a doctor, who in many cases conducts his work at the elementary schools. Vocational guidance is clearly being organized in Germany on sound lines. It is too early yet to estimate the success achieved. Certainly no data are given indicating that labor turnover is being reduced in this way.—E. L. C.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

Recreation Grounds Popular with Minute Employees. *Nation's Health, April, 1925, vol. 7, p. 272.*

The Minute Tapioca Company at Orange, Mass., provides for its employees' recreation a tract of 100 acres easily accessible from town by the Company's bus. The recreational plan, which is organized as a club, has done much to encourage healthful habits of living and to create a love of outdoors among the people. Provision is made for swimming, tennis, volley ball, dancing, and other sports. Camping space and a well-equipped kitchen with open-air army stoves are available for week-end parties.—E. S. C.

Leisure for Workers. *Med. Jour. Australia, March 28, 1925, vol. 1, pp. 322–323.*

This is merely an annotation drawing attention to the importance of healthy recreation during spare time. If facilities are not provided, then such things as alcoholism, tuberculosis, and venereal diseases spread. The recommendation on this point of the International Labour Conference held at Geneva in 1924 is particularly put forward for consideration; it included (1) the encouragement of individual hygiene by the provision of public baths and swimming pools; and (2) legislative or private action against misuse of alcohol, against tuberculosis, venereal disease, and gambling.—E. L. C.

Wage-Earners as Civic Reformers. *B. M. Selekman. Nation's Health, March, 1925, vol. 7, pp. 186–187.*

"Sharing Management with the Workers," a report recently published by the Russell Sage Foundation, is a study of the plan in operation since 1918 at the Dutchess Bleachery, Inc., Wappingers Falls, New York. A committee of workmen were given charge of rehabilitating the dilapidated and insanitary company houses, and of the recreational and educational program of the village. The attitude of employees toward produc-

tion has been revolutionized to such an extent that the company earned comparatively high dividends during a business depression when other plants in the same industry were idle.—E. S. C.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

X-Ray Injuries as Accidents and as Occupational Diseases. *W. Flaskamp. Abstr. as follows from Fortschr. a. d. Geb. d. Röntgenstrahlen, 1924, vol. 32, pp. 641–647, in Med. Science, April, 1925, vol. 12, pp. 79–80.*

The author considers the medico-legal aspect of a case in which a person working in an X-ray laboratory underwent a severe X-ray injury. Radiographs of the vertebral column were taken in 1897 in which the skin was exposed three times within eighty-one minutes, and twenty-four hours later there was a severe burn of the abdominal wall which necessitated treatment for a year and ultimately healed, but for the first three to four years recurred at times, and even now is liable to the formation of scabs. The patient demanded compensation for accident. The legal side of the question consisted in determining whether the condition was "accidental" or arose "in and out of his occupation." At a later date he noted an ulcer over the metacarpophalangeal joint of the left ring finger, which extended and ultimately rendered him incapable of work. Again the same legal question arose. It is unnecessary to enter here into the arguments adduced, but it is concluded that it is an "accident" if the X-ray injury starts acutely after a single irradiation or one definitely limited in time (in a single shift of work). On the other hand, it is to be regarded as an occupational disease if it results from a series of irradiations over a longer period, even though a single particularly intense irradiation (which of itself might have been sufficient to act injuriously) has actually called the burn into existence. Of course the interpretation applies primarily to Germany, but with the great extension of X-ray work similar difficulties must arise in this country.

Labor Laws of the United States with Decisions of Courts Relating Thereto. *U. S. Bur. Labor Statistics, Bull. No. 370, May, 1925, pp. 1240 with index.*

Comparison of Workmen's Compensation Laws of the United States as of January 1, 1925. *L. D. Clark. U. S. Bur. Labor Statistics, Bull. No. 379, Jan., 1925, pp. 15.*

Sickness Insurance: Comparative Analyses of National Laws. *Internat. Labour Office, Studies and Rep., Series M (Social Insurance) No. 4, 1925, pp. 133.*

Unemployment Insurance: Study of Comparative Legislation. *Internat. Labour Office, Studies and Rep., Series C (Employment and Unemployment) No. 10, 1925, pp. 134.*

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

INDUSTRIAL HYGIENE. *Med. Jour. Australia, June 13, 1925, vol. 1, pp. 635–637.*

Interesting facts are here quoted from a report, made by Dr. C. Badham, medical officer of industrial hygiene in the department of public health, New South Wales, upon the health of certain textile workers. In the spinning section, labor turnover was high; out of 268 persons employed, 201 (75 per cent.) had been employed under one year and of these 52 (25.9 per cent.) had been employed under one month. Among the men renal disease was found in 14 per cent., the high incidence being attributed to the fact that workers for these light occupations were recruited from men so broken in health as to be unfitted for heavy toil. In all 60 per cent. of the men were not in good health. Rhinitis attributed to exposure to dust was present in 8 per cent. The time lost for sickness was comparatively low.

Among the women menstrual

trouble, nephritis, anemia, and rhinitis were found, together with undue fatigue. Working conditions were adverse since for some 200 days in the year the temperature would be about or above 80°F. and often approach 90°F.; but these conditions are difficult to avoid since on 203 days each year in Sydney the outside temperature may be expected to reach or exceed 70°F.

Dr. Badham holds that the problem of securing a reasonable temperature together with air movement has received little consideration and that the Factories Act regulations have not been enforced. He proposes a scale of temperatures, cooling power, and air movement which he considers reasonably practicable, but it is not on a high hygienic standard.

Precautions are also recommended to minimize exposure to dust, particularly at the opening and carding processes.—E. L. C.

MEDICAL SERVICES IN THE FACTORY. *T. M. Legge. Lancet, July 4, 1925, vol. 2, p. 36.*

Giving evidence before the Royal Commission on National Health Insurance, Sir Thomas Legge said he did not regard industrial hygiene and industrial medicine as an entity in itself, but simply as a specialized part of general medicine and surgery, from which they cannot properly be detached. Early clinical evidence of disease predisposed to, accentuated, or produced by industry is wanted (1) for diagnosis, (2) for prevention, and (3) for treatment. He advocated that in industrial areas certain practitioners should be given the duty of keeping workers as far as possible from succumbing to illness and so becoming a charge on the insurance funds.—E. L. C.

MEDICAL INSPECTION OF FACTORIES. *T. Legge. Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 65–82.*

Many investigations are referred to. One was into the physical effects of pneumatic tools; here Dr. E. L. Middleton thinks the blenching of the fingers which occurs, especially on cold winter days, may be due to pressure on the ulnar artery between the tool and the rigid flexor tendons of the fingers. Lead poisoning cases have increased, particularly in shipbreaking work; here up to the present no practical method has been found for avoiding the inhalation of lead fumes given off when the oxyacetylene flame is playing on painted metal plates. A new code of regulations has been applied to the manufacture of electric accumulators required for motors and wireless; the investigation on which the code was based and also the work of Dr. A. Sellers done in this industry on the importance of punctate basophilia in lead workers have both been published in THIS JOURNAL (see 1925, vol. 7, pp. 145, 451). Little trouble is reported from arsenic, mercury, or toxic jaundice; but epitheliomatous ulceration has called for considerable attention, particularly as caused by oil among mule spinners in the cotton industry, and also among workers in other industries with similar exposure; the minimum period of exposure recorded was twenty years. Reference is made to the occurrence of poisoning

from a number of gases and fumes, of which most were due to carbon monoxide; fortunately the fatalities were few. Improvement of localized ventilation in the pottery industry is needed to reduce exposure to flint dust, for which an arbitrary standard of 500 particles in 1 c.c. of air is found generally to be exceeded. An outbreak of weavers' cough, probably due to aspergillosis, occurred, but the exact organism responsible could not be isolated; it arose from mildewed warps.

A study of the causation of septic injuries in different industries is of interest; thus in fish curing 76 per cent. and in wood working 61 per cent. were punctures, as against 25 per cent. in shipyards; in metal working 56 per cent. were lacerations as against 30 per cent. in wood working.

The numbers of young persons examined for fitness by certifying surgeons were 160,534 males and 192,217 females, of whom 3,328 males and 7,063 females were rejected; the greater number of females entering industrial life than males and the higher proportion of rejected among them are of interest.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

INFLUENCE OF SPLEEN IN CARBON MONOXID POISONING. *J. Barcroft, C. D. Murray, D. Orahovats, J. Sands, and R. Weiss. Abstr. as follows from Jour. Physiol., May 21, 1925, vol. 60, p. 79, in Jour. Am. Med. Assn., July 4, 1925, vol. 85, p. 71.*

In an atmosphere which receives a continuous accession of coal gas, guinea-pigs from which the spleens have been removed die sooner than either normal guinea-pigs, those from which omentum has been removed, or those from which one horn of the uterus has been excised.—K. R. D.

THE PRESENCE POST MORTEM OF NITRIC-OXIDE-HAEMOGLOBIN. *H. A. L. Banham, J. S. Haldane, and T. Savage. Brit. Med. Jour., Aug. 1, 1925, vol. 2, pp. 187–189.*

A case is described of a stoker who died apparently from bronchopneumonia nine days after being taken ill while at work. Just before death he was deeply cyanosed, but at post-mortem the blood throughout the body had a red or pink color. At a subsequent inquest death was ascribed to carbon monoxide absorbed nine days earlier before leaving work. The authors give reason for holding the color found to have been due to nitric oxide hemoglobin caused after death by a nitrifying organism present in the body and probably the pathogenic organism of the bronchopneumonia. They claim from a medicolegal standpoint that the possible presence of nitric oxide hemoglobin must always be considered in suspected cases of carbon monoxide poisoning. Distinction can be made by boiling a watery solution of the blood; if the red color, chemical reactions, and spectroscopic appearances are due to nitric oxide hemoglobin, the coagulum will be pink.—E. L. C.

POISONING BY GAS DEVELOPING FROM A FERTILIZER. *H. Fuchs. Abstr. as follows from Časopis lékařu českých, Prague, May 23, 1925, vol. 64, p. 822, in Jour. Am. Med. Assn., July 25, 1925, vol. 85, p. 315.*

Fuchs observed a disturbance of the sensorium, headaches, and dyspnea in a farm laborer who had been spreading a fertilizer. The powder had an odor resembling illuminating gas.—K. R. D.

INVESTIGATION OF TOXIC GASES FROM MEXICAN AND OTHER HIGH-SULPHUR PETROLEUMS AND PRODUCTS. REPORT BY THE BUREAU OF MINES, DEPARTMENT OF THE INTERIOR, TO THE AMERICAN PETROLEUM INSTITUTE. *R. R. Sayers, N. A. C. Smith, A. C. Fieldner, C. W. Mitchell, G. W. Jones, W. P. Yant, D. D. Stark, S. H. Katz, J. J. Bloomfield, and W. A. Jacobs. U. S. Bur. Mines, Bull. 231, 1925, pp. 108.*

This is an excellent analysis of an important industrial field. Following statements covering the chemical and physical nature of Mexican oils, the hygienic and medical aspects of the problem are investigated. The authors' summary of this material is quite complete and follows:

Correlation of the Data Obtained from Refinery Accidents with a Laboratory Study of Poisoning and its Treatment

A study of the accident records of oil refineries shows that prior to 1919 very little if any data were obtained on poisoning by gas; but with the development of the medical and safety departments and the adoption of industrial insurance, investigations into poisoning have been made, and valuable information has been collected.

Analyses of gases by plant chemists show the presence of H_2S, but no record was found of an analysis of the poisonous atmosphere at the time of an accident. Gas analyses made during this investigation prove the presence of H_2S in toxic quantities at various parts of the refinery system and confirm the assumption that gas accidents recorded were caused by leakage of H_2S into spaces entered by men. Study further reveals the fact that men of many nationalities, of all ages, and with many years of service have been poisoned. Cases may be acute, or violent (asphyxia), and subacute, or between mild and chronic (irritation of the conjunctiva and the respiratory tract). The symptoms in these cases are almost identical with those of poisoning by H_2S.

Hydrogen sulphide was shown to be absent from the coke stills during ventilation and cooling. Conjunctivitis (inflammation of the eyes) in still cleaners may be caused by high temperatures or by sweat getting into the eyes.

The toxic action of H_2S has been studied on animals and men. Hydrogen sulphide has been found to be toxic in concentrations as low as 0.005 per cent, and men exposed daily to such percentages would in all probability suffer irritation of the eyes and respiratory tract, or subacute poisoning. As the concentration rises the effects become more intense, and the length of time elapsing before signs of severe poisoning and death is shorter. When a concentration of H_2S of 0.06 to 0.08 per cent is reached, dogs are affected almost immediately and collapse instantaneously (acute poisoning), followed by suspension of breathing, heart failure, and death. The conclusion, from the similarity between dogs and men in their response to H_2S, is that the above concentration would probably cause like symptoms in both.

The pathological findings (changes in tissue through injury or disease) in subacute cases are typical of irritation with congestion, edema (swelling due to watery fluid in tissues), and degeneration and destruction of the alveolar cells (cells lining the terminal air sacs in the lungs). The alveolar spaces may contain transudate (watery fluid from the blood) and cellular elements (red and white blood cells and alveolar cells). The microscopical findings of lung tissue in most acute cases are not

far from normal. Some cases show evidence of congestion of the lungs.

A study of cases of poisoning by refinery gases shows that no definite method for the treatment for acute cases exists, but treatment for subacute cases is symptomatic. For conjunctivitis, it consists of irrigation with boric acid solution followed by argyrol, usually 10 per cent.

In more pronounced cases, a bland ointment, such as vaseline, neutral petrolatum, or boric acid ointment should be applied to the eyelids. Sometimes, when pain is marked, ice compresses are beneficial when applied for 15 minutes to an hour three times a day. Early use of smoked glasses will relieve eyestrain. For pharyngitis (inflammation of the mucous membrane of the throat), an application of 10 per cent silver nitrate or argyrol is advisable, and the use of an oily spray may be an aid. For bronchitis, the use of an expectorant is advisable. A patient with fever should be confined to bed. These cases always should be under the direction of a physician.

Investigation of the treatment for acute H_2S poisoning was made with animals as subjects. Various respiratory stimulants were tried with artificial respiration. The data obtained showed that artificial respiration should be given immediately after rescue. Many lives may be saved in this way. Oxygen was beneficial when given at once.

Respiratory Protective Devices against Petroleum Gases and Vapors

Protection to men entering atmospheres containing petroleum gases and vapors or H_2S is afforded by various types of respiratory apparatus such as gas masks, hose masks, and oxygen breathing apparatus. Each has its own limitations as well as advantages, and must be used only under proper conditions.

The canister type of gas mask containing 600 c.c. of dry high-grade activated charcoal protects a wearer 1 hour or more against 1 per cent of gasoline vapor in air which is otherwise normal. It, however, protects against 1 per cent H_2S in air only $3\frac{1}{2}$ minutes. The same canister filled with soda lime protects against 1 per cent of H_2S for 17 minutes, but does not protect against gasoline vapor. The same canister filled with the Army gas-mask mixture of charcoal and soda lime protects against 1 per cent of gasoline for 36 minutes, and against 1 per cent of H_2S for 11 minutes. Longer protection can be had by using larger canisters, that of 3,600 c.c. capacity being the largest practicable size.

Canister gas masks are not suitable for rescue and emergency use in confined or unventilated places. They should be used only where ventilation supplies enough oxygen to support life, and where the concentration of toxic gases is so low that men can work without protection for short periods; as, for example, places where the workmen suffer from dizziness, headache, and other ill effects. These effects can be eliminated by the use of the canister gas mask, but the general use of this type of mask is not recommended.

Hose masks protect against any irrespirable atmosphere that the wearer's skin will endure. The hose makes them somewhat cumbersome and limits the wearer's field of action. They are simple to use, require little training, and are comparatively inexpensive. The pressure type of hose mask is the safest of all breathing apparatus, as it requires an attendant to operate the air pump, and prevents leakage of gas into the mask.

Self-contained oxygen breathing apparatus protects against all irrespirable atmospheres and allows much greater field of action. The weight of the apparatus and the necessity of special training of the wearer are the chief disadvantages. Some of these disadvantages have been largely overcome in the new McCaa half-hour oxygen breathing apparatus developed by the Bureau of Mines. It weighs 17 pounds, approximately half that of the 2-hour types of apparatus. It is compact and is worn on the chest, thus permitting the wearer to enter tanks through manholes more easily. The breathing bag is impermeable to gasoline vapors, and the minimum service time of 30 minutes is ample for rescue and emergency work. Men must be trained in its use in the same way as for the 2-hour apparatus. The hose masks of the pressure type will probably be the most useful in oil refineries.

Self-contained oxygen breathing apparatus (McCaa half-hour type) will probably be most satisfactory for rescue and recovery work, whereas the canister gas mask can be used only for protection where men are accustomed to work in low concentrations.

. . . .

Recommendations

1. Because of the toxicity of H_2S, all gases and vapors from Mexican and other high-sulphur petroleums should be confined, as far as practicable, to closed systems of manufacturing equipment and piping, and the tankage should be properly vented.

2. Inasmuch as gas may unavoidably escape in some stages of handling the oil, protection should be provided employees in all such stages if possible.

3. Employees should be instructed regarding the injurious properties of the gas, and warned to avoid it.

4. Employees should be trained in rescue methods and in first-aid treatment, particularly in methods of artificial respiration and the administration of oxygen to men overcome by gas.

5. Hose masks or oxygen breathing apparatus, or both, should be available at convenient points; and men should be instructed in their correct use and proper care.

—C. K. D.

Dupuytren's Contraction in Lead Poisoning. *J. Michaux et al. Abstr. as follows from Bull. et mém. Soc. méd. d. hôp. de Paris, May 22, 1925, vol. 49, p. 782, in Jour. Am. Med. Assn., July 25, 1925, vol. 85, p. 308.*

Among thirty-three persons with this deformity, twenty-four had a history of lead poisoning. Michaux, Lamache, and Picard consider Dupuytren's contraction as a tardy and persisting sequela of lead poisoning, which may assist in the diagnosis of the latter.—K. R. D.

Tetra-Ethyl Lead Poisoning. Clinical Analysis of a Series of Nonfatal Cases. *R. A. Kehoe. Jour. Am. Med. Assn., July 11, 1925, vol. 85, pp. 108–110.*

In man, poisoning by tetra-ethyl lead is produced as a result of inhalation of the vapor and as a result of skin absorption. Subjective symptoms are: an early and troublesome insomnia; nausea, anorexia, and vomiting, especially in the early morning; vertigo and dull headache; and muscular weakness. Objective signs are: pallor, subnormal blood pressure, subnormal temperature, loss of weight, tremor, occasional lead line, and excretion of lead in urine and feces.

In severe cases, a central nervous system involvement is the essential characteristic. The patient is in a constant state of excitement which may progress to mania and death from exhaustion.

Kehoe's treatment, which gave good therapeutic results, consisted in the daily administration of from 20 to 30 gm. of mixtures of sodium bicarbonate or sodium citrate, magnesium oxide, and calcium carbonate. In more severe cases magnesium sulphate was added. No narcotics were used.—K. R. D.

Inhalation of Acid. *A. Hartmann. Abstr. as follows from Deutsch. med. Wchnschr., May 22, 1925, vol. 51, p. 867, in Jour. Am. Med. Assn., July 25, 1925, vol. 85, p. 312.*

Hartmann reviews the observation on the protective influence of inhalation of acids in factories and schools. Its action seems to be distinct in influenza, bronchitis, and tuberculosis. An open dish with formic acid kept in

the room exerts some influence. Chlorine hurts the tissues more than sulphur dioxide. Hydrochloric acid has a more pronounced action in tuberculosis and hay-fever.—K. R. D.

DANGEROUS TRADES. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 28–43.*

Codes of regulations, thirty in number, control certain dangerous trades. Three other codes are under consideration. Mr. Macklin, who reports on the celluloid industry, states that protection against explosion and fires has been effective but that vigilant inspection is needed to prevent catastrophes. He remarks upon the increasing use of spraying machines for applying solutions of celluloid in evaporating solvents which promise to replace varnishes; fumes from the solvents cause risk to health and from fire which can only be met by ample ventilation. These dangers are rapidly growing in the United States where spraying machines are used for motor body repairs in small, crowded garages.

The new Chemical Code is proving of value in many ways particularly with regard to risk in entering tar stills. Efficient breathing apparatus must now be provided and precautions taken; even so, one serious fatality occurred due to neglect to comply with the Code.

A boom in demand for electric accumulators for motors and wireless led to strengthening the code governing their manufacture. The need was considerable since cases of lead poisoning in this industry rose from an annual average of thirty-five to ninety-five in 1923 and 101 in 1924. A report on this industry by Mr. C. M. Price and Dr. J. C. Bridge has recently appeared in THIS JOURNAL (see 1925, vol. 7, pp. 451-474).

In the rubber industry conditions of health and comfort are said to be better than a few years ago; fumes of solvents are being recovered and the use of litharge is declining. Extended use of latex which simplifies processes and is beneficial hygienically is noted.

Advance is reported in dust prevention in the pottery trade and in safeguarding wood working machinery.—E. L. C.

DUST HAZARDS AND THEIR EFFECTS

A NOTE ON LUNG FIBROSIS IN IRON MINING. *K. W. Goadby. Paper read at Royal Microscopical Society Conference, Sheffield, April 20–22, 1925.*

SIDEROSIS OF LUNGS. *E. Hoke. Abstr. as follows from Med. Klin., May 22, 1925, vol. 21, p. 766, in Jour. Am. Med. Assn., July 25, 1925, vol. 85, p. 313.*

Hoke emphasizes the frequent absence of physical signs with roentgenologically grave changes. An absence of shifting of the borders of the lungs with changes of position of the body is important. Young patients are in great danger of tuberculosis. In pneumonokoniosis of long standing the tuberculosis is mild.—K. R. D.

PNEUMOCONIOSIS—THREE CASES: TWO OF SILICOSIS, AND ONE OF ANTHRACOSIS WITH TUBERCULOSIS SUPERINDUCED. COMPLETE HISTORIES WITH TEMPERATURE CHARTS, X-RAY PICTURES AND COLORED PLATES OF LUNGS. *N. Y. State Dept. Labor, Div. Indust. Hyg., 1925, pp. 31.*

This bulletin represents a combination of effort on the part of state authorities, hospital physicians, and an industrial physician to center attention on a common industrial condition by reporting three well-marked cases which have come to autopsy. All of these patients suffered notable damage from their work, but this harm was extreme before it came to attention and was of certain enough type to permit diagnosis. The cases illustrate the great difficulty of defining the pneumonokonioses early and making them a fair basis for compensation. They are accompanied by a useful bibliography.—C. K. D.

PNEUMONOCONIOSIS. *Netherlands Letter, Jour. Am. Med. Assn., July 11, 1925, vol. 85, p. 127.*

The report of the bureau of labor inspection contains a detailed study on the trade of quarriers and stone cutters, and gives some interesting details of the operation of a law that has been in force in The Netherlands since 1921. Up to 1921, the trade had been regulated by a law that did not require the regular examination of adult workmen. The new law, however, provides for the examination of workmen every three years at the longest, in order that the dangerous processes resulting from the continued inspiration of dust, leading to pneumonokoniosis, may be supervised and controlled. The latest researches, covering 963 individuals, showed 498 persons without physical defects and 465 with clinical signs of pulmonary lesions, the presence of which was confirmed in more than 100 instances by a roentgenographic examination. These results furnish sufficient evidence for the need of medical supervision of this industry.—K. R. D.

DUST FROM DISCHARGING AND HANDLING GRAIN CARGOES. *L. C. McNair and E. L. Middleton. Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 103–109.*

The authors found the dust evolved varies with the grain, and is worse where bucket elevators are in use than where the pneumatic system is employed; use of the latter presents the only method of obtaining reasonable working conditions in ship holds. Weighing machines ought to be arranged so that dust does not reach the attendants; in one instance 1,700 mg. per 10 cubic meters of air were found. Other points of dust exposure are described. The dust is composed of (*a*) sharp spike-like hairs and (*b*) fragments of vegetable and mineral matter and spores; the hairs vary with the grain from which they originate. The theory is adopted that these hairs produce the respiratory symptoms experienced by the workers. The symptoms are irritation of the upper air passages, sneezing, coughing, a burning sensation in the chest, with discomfort and distress. The onset is immediate and the discomfort increases with exposure; but some diminution in sensitiveness is established in time. Dockers tend to leave

work on grain as they grow older. Dust from wheat, although it is the cleanest grain handled, is the most consistently irritating. Barley hairs were found to be smaller than wheat hairs and so, although not producing such immediate symptoms of irritation, are likely to penetrate farther into the air passages and establish bronchitis. No evidence was gathered that maize cargoes give rise to injurious dust. Grain cannot be made dust free, since dust is formed from attrition of the grains wherever it is moved. Closed-in apparatus with efficient exhaust arrangements is needed wherever grain is being moved.—E. L. C.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

PRELIMINARY REPORT ON THE CAUSES OF THE RECENT DECLINE OF TUBERCULOSIS MORTALITY. *Y. M. Biraud. Fourth Session, Health Committee, League of Nations. Geneva, C. 224. M. 80, 1925, III.*

This document is a long and interesting one in which an excellent case is made for conducting an international investigation of statistics of mortality from tuberculosis in different countries and at different times. Valuable preliminary records are given for England and Wales, Scotland, Prussia, Switzerland, The Netherlands, France, and Spain which indicate the importance of the proposal. By collating such records light would be shed on the existence of any connection between general mortality and tuberculosis mortality; on the action of food in increasing resistance to the disease; on tuberculosis in infancy and childhood in relation to milk; and on the specific influence of industrial work and industrial environment. This last study will require distribution by sex and age groups in rural and urban districts, in nonindustrial and industrial countries, and in the same countries before and after the era of industrialism. The conclusions from such a study when made cannot fail to be of great importance.—E. L. C.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

CHRONIC SUNBURN AND EPITHELIOMA OF THE SKIN. *W. Dubreuilh. Med. Press, July 8, 1925, pp. 27–29; July 15, 1925, pp. 47–49.*

Acute sunburn causes a feeling of warmth. Several hours later erythema appears. In twenty-four hours redness and swelling with the formation of blisters are evident. In a few days these subside leaving, in brunettes, a brown color, and in fair people freckles. Similar symptoms follow exposure to the electric arc light. All these effects are entirely due to the short ultra-violet and violet rays. The caloric infra-red and red radiations play no part in the above skin changes. The sunlight reflected from water or snow

enhances these results. A diffuse pigmentation is an efficient protection against actinic rays, whereas freckles are not. Brown-skinned people like the Hindus, Arabs, and negroes never suffer from erythema solaris. Dubreuilh believes that keratosis senilis is caused by actinic rays and therefore should be named keratosis solaris.

Discoloration, hyperkeratosis, etc., of the skin are not due to the influence of old age. They are the symptoms, in susceptible persons, of continued exposure to the sun. They are not seen on the parts of the skin which are properly protected by clothing. After the macular discoloration, red vascular patches consisting of clusters of small veins make their appearance, then follow achromic spots or areas. The keratomata begin as crusted patches, varying in size from a hempseed to a shilling. These sun-caused changes, especially the keratosis and its sequel, multiple epitheliomatosis, constitute a comparatively common rural disease. It is especially seen in agricultural workers. Laborers of northern extraction more readily become victims than the Mediterranean races. The town dweller is usually free from this liability.—R. P. W.

Skin Diseases. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 65-82.*

One can discover much tragedy and human endeavor if one reads between the lines of the bald official statements contained in this report. In the medical section of this blue book, contributed by Sir Thomas Legge, the industrial dermatologist will be struck by the scarcity of new active chemical irritants reported. Old well-known injurious agents such as chrome, arsenic, and certain distillates of coal and petroleum continue to exact their long roll of human suffering.

Two cases of epitheliomatous ulceration are recorded due to the dust of sodium arsenite in sheep dip manufacture. Out of 11 blowers, grinders, and packers of this material, in 5 the septum of the nose was ulcerated and in 1, perforated. In all the skin of the axillae and neck appears to have been deeply pigmented. In 4 there was dermatitis.

Ulcers of the skin were noted 11 times in the manufacture of chrome, 18 times in chrome dyers and finishers, 6 in tanners, and 10 in other chrome processes. In the making of chrome Dr. Hamilton examined the condition of the nasal septum in 27 workers. Ulceration was found in 40.7 per cent. and perforation in 37 per cent. Legge again draws attention to the interesting fact that chrome irritation, though persistent and perhaps prolonged during life, does not give rise to malignancy. To the abstractor, the probable reason, not explanation, is that chrome acts as an oxidizer, that is, as a proteolytic destroyer rather than a keratogenetic or neoplastic proliferator. This activity is seen in arsenic, certain oil and coal distillates, radiations, etc. It is not possessed by all irritants.

In this 1924 report, 15 more deaths are mentioned from cancer in mule spinners. In 82.2 per cent. of the total number enumerated, the scrotum was affected and in the remainder the face, arm, leg, or other part of the body. Of the 252 cases investigated during 1923 and 1924, 42 per cent.

have died from the disease. Outside of cotton mule operatives, during the last ten years only 27 cases of skin epitheliomata have been traced to other industries. One developed on the hand, 25 attacked the scrotum and the corresponding part of the only woman (cotton weaver) affected. The opinion is expressed that in all of these cases pitch or oil is the cause.

In a tar distilling plant out of the 72 men examined 1 was found suffering from scrotal cancer. In another plant Dr. Henry examined 24 of the men who had completed fourteen to forty-two years of service. In 7 folliculitis was present; epitheliomatous ulceration in 4; sebaceous cysts in 4; ulceration of the cornea in 2; keratosis in 1; and a dry scaly dermatosis in another.

During the year 1924 cases of dermatitis have been reported 306 times. Dyes were responsible for 55; alkalies, 40; oil, 27; sugar, 18; bakers' itch, 15; turpentine, 15; nickel salts, 14; acids, 13; TNT, 12; naphtha, 9; heat, 8; water, ammonia, ammoniacal salts, shellac, pumice powder, and wood dust, 5 each; mercuric chloride, accelerine, arsenious acid, glue, sand, gutta-percha, tobacco leaf, etc., 1 each. Doubtful cases number 16, and nonindustrial, 11. Dr. Bridge has reported on the incidence of dermatitis among furniture polishers. In 1923 the number of cases which received compensation was 32. The bichromates appear to be the chief offenders in this industry.

Bismarck brown was responsible for a dermatitis in women stitching leather. It had been stained with this color.

Two outbreaks of "barley itch" occurred at Bristol from unloading infected grain.—R. P. W.

PENETRATING STEEL FRAGMENT. *Am. Jour. Ophth., April, 1925, vol. 8, p. 319.*

This is the report of a case presented before the Colorado Ophthalmological Society, Dec. 20, 1924.

The patient's right eye had been struck with a fragment of steel while he was using a hammer on September 10. There was a perforating wound in the margin of the right upper eyelid about 3 mm. to the nasal side of the center, and a vertical wound through the sclera 3 mm. long, located 5 mm. above the nasal margin of the cornea. By X-ray, a foreign body 1.5 by 2.5 by 3 mm. in size had been located in the orbit above and to the nasal side of the eye, and magnet examination had also demonstrated that the foreign body was not in the eyeball. After five days from the injury the hemorrhage into the vitreous had become partly absorbed, and vision had improved to 5/60; but since that time the vision had failed so that it was practically limited to light perception. The vitreous contained some organized exudate, and floating yellowish-white tissue. No further treatment seemed indicated as regards the foreign body. Unfortunately the patient had removed his goggles just before the accident.

In the discussion which followed presentation of this case, comment was made on the fact that so apparently slight a traumatism should have caused so much loss of vision. The explanation was given that the hemorrhage from the ciliary body, resulting from the terrific blow, destroyed the eye. The opinion was expressed that it is not too late to hope for improvement after a year or more in such a case.

REPORT OF COMMITTEE ON COMPENSATION FOR EYE INJURIES. *N. M. Black, A. C. Snell, J. Patton, H. S. Gradle. Jour. Am. Med. Assn., July 11, 1925, vol. 85, pp. 113–115.*

This final report of the Committee on Compensation for Eye Injuries appointed by the Section on Ophthalmology of the American Medical Association outlines the method elaborated by the Committee for determining the loss of visual efficiency of a person who has suffered impairment of vision as a result of occupational disease or injury, and submits a formula for calculating the industrial visual efficiency of the individual and the compensations deserved.—K. R. D.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

INDEX TO PROCEEDINGS OF INTERNATIONAL ASSOCIATION OF INDUSTRIAL ACCIDENT BOARDS AND COMMISSIONS 1914–1924. *G. L. Tibbott. U. S. Bur. Labor Statistics, Bull. No. 395, June, 1925, pp. 57.*

THE IGNITION OF FIREDAMP. *H. F. Coward and R. V. Wheeler. Safety in Mines Res. Board Paper No. 8. H. M. Stationery Office, 1925.*

THE LAG ON IGNITION OF FIREDAMP. *C. A. Naylor and R. V. Wheeler. Safety in Mines Res. Board Paper No. 9. H. M. Stationery Office, 1925.*

Abstracted as follows in Circular of British Mines Department.

There is an intimate connection between the subject matter of these two reports, and they should be read in conjunction. The first constitutes a concise and practical summary of the objectives of research on the ignition of firedamp with reference to the requirements of the coal mining industry, and the results so far attained. The objectives are (1) to ascertain the conditions under which firedamp will ignite, in order that means may be taken to avoid the occurrence of such conditions in the pit, and (2) to ascertain which are the most readily ignited mixtures of firedamp and air, in order that these mixtures may be used when determining the liability of colliery equipment, such as flame and electric lamps, electrical apparatus generally, and explosives, to ignite firedamp.

The paper alludes to the classic researches of Sir Humphrey Davy, made more than a hundred years ago, and ably followed up by Mallard and Le Chatelier in France toward the end of the last century. Among the many valuable discoveries and confirmations resulting from recent research, a few interesting particulars may be selected. It is shown that a mixture of firedamp and air can be ignited without the application of flame merely by raising it to a certain temperature either directly by the application of heat, or, indirectly, by submitting the mixtures to adiabatic compression (that is, compression without loss of heat to the containing walls before the process is complete). The fact that a firedamp-air mixture can be ignited by pressure alone may have an important bearing on the possibility of the ignition of pockets of gas in crevices by the pressure produced when a shot is fired even though the flame of the explosive is entirely suppressed.

When an inflammable mixture of firedamp and air is raised to, and maintained at, a temperature higher than the "ignition temperature" it becomes ignited—but not immediately; there is a certain interval, termed the "lag on ignition," the length of which depends upon the temperature and upon the composition of the mixture. This "lag on ignition," which is dealt with in the second report, is not peculiar to firedamp but it is more marked with it than with some other inflammable gases, as hydrogen, for example.

Lag on ignition has an important bearing on safety in coal mines. It accounts for the fact that it is very difficult, if not impossible, to cause an external ignition of firedamp by the gauze of a miner's flame safety lamp heated by firedamp burning within it; and it provides grounds for the hope that it may be possible to compound explosives, the flames from which, being of exceedingly short duration, could not ignite firedamp despite their high temperature. The second report deals, more particularly, with the results obtained by studying, as fully as possible, the phenomena accompanying the lag on ignition of firedamp, but as a necessary aid to the interpretation of these results the behavior of other and dissimilar gases has also been studied.

In the first report, phases of the subject of the ignition of firedamp, with direct practical bearing, such as ignition by heated surfaces and wires (including incandescent filaments of electric lamps), frictional sparks, flames and electric sparks, are discussed.

FIREDAMP EXPLOSIONS WITHIN CLOSED VESSELS. THE EFFECTS OF TURBULENCE. *G. B. Maxwell and R. V. Wheeler. Safety in Mines Res. Board Paper No. 10. H. M. Stationery Office, 1925. Abstr. as follows in Circular of British Mines Department.*

To avoid danger in the use of electrical apparatus in coal mines, which may be caused by the ignition of inflammable gas entering the apparatus from the surrounding atmosphere, legislation requires that all electrical apparatus liable to sparking shall be protected by flame-proof casings. It has been shown that, in order to render flame-proof casings of moderate volume, a vented-flange construction, or with enclosures of considerably greater volume than 8 liters (488 cubic inches), an arrangement of perforated plates, gives satisfaction. It is known that turbulence modifies the character of an explosion of firedamp and air occurring within a closed vessel, and, as mining electrical machines of the motor type comprise rapidly revolving parts which induce turbulence, it is important to determine the extent to which such turbulence may affect the safe use of the machines.

The present paper contains a short history of the problem, and describes an experimental investigation carried out by G. B. Maxwell and R. V. Wheeler for the Safety in Mines Research Board. The effect of turbulence on the development of firedamp explosions in closed vessels has been studied in relation to (*a*) the maximum pressures produced, and (*b*) the time taken to attain the maximum pressure. It is shown that, whereas considerably

enhanced pressures can be obtained from weak mixtures of methane and air when they are turbulent, the most explosive mixtures (containing between 9 and 10 per cent. of methane) are not much affected even by extreme turbulence. The maximum pressure obtainable from any quiescent mixture of methane and air, initially at atmospheric pressure, when exploded in a closed vessel is about 105 to 110 pounds per square inch. The effect of turbulence is to increase this maximum pressure by about 4 per cent. On the other hand, with both weak and strong mixtures the effect of turbulence is greatly to increase the rapidity with which the maximum pressure is attained. Finally, the investigators make the reassuring statement that neither the slight increases in maximum pressure from turbulent mixtures, nor the greatly increased rapidity of development of pressure, affect the safety of "flange protection" devices for flameproof mining electrical apparatus.

SAFETY. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 11–28.*

An alteration in the legal definition of a reportable accident from seven to three days' incapacity has caused an apparent increase in accident occurrence. Some definite increase, however, seems to have taken place, since there were 956 fatalities, eighty-nine more than in 1923. The reason may lie in increased use of power, which is shown by an increase in the number of factories which totaled 142,494, being for the first time larger than the number of workshops, 133,729. The tendency is for small places to be absorbed by big. Where trade improved, as in shipbuilding, accidents increased; but for the most part trade depression is reported. Most casualties occur in a comparatively limited group of industries, and within the group a few large concerns are responsible for the lion's share. The highest peaks occur in March and October, and the curve falls in holiday months. Accident causation is being carefully studied by types of danger, rather than by industry—a valuable method; thus prime movers, wires, cranes, and hoists are common to industry in general. Nine explosions are reported due to ignition of organic dusts of coal, rice, cottonseed, oil cake, malt, and rubber. Others happened in dry cleaning, in acetylene plants, and in drying cylinders. Such occurrences seem preventable, but an "accident sense" is the best preventive, and is only obtained through safety-first education. The vast majority of accidents can be avoided by no other form of protection. Campaigns on these lines are reported to have been uniformly successful: both frequency rates and severity rates have been reduced; in one instance lost-time accidents fell from 347 to 146, the frequency rate from 50 to 34, and the severity rate from 3.05 to 0.71; in another, 60 per cent. was saved in compensation claims.

The bursting of abrasive wheels is being reduced by the substitution for natural grindstones of artificial wheels. The latter are safer, do better work, save labor in racing and hacking, generate far less dust and that not composed of the harmful silica. This movement is welcome in every way and should finally abolish grinders' rot.—E. L. C.

INDUSTRIAL SURGERY

TENNESSEE COMPANY STANDARDIZES CERTAIN SURGICAL PROCEDURES. *H. E. Conwell. Nation's Health, June, 1925, vol. 7, pp. 408–409.*

After giving a résumé of 1,125 cases of acute industrial fractures, burns, and abdominal injuries treated at the Employees' Hospital of the Tennessee Coal, Iron & Railroad Company, Fairfield, Ala., during the last two years, the author outlines the general principles of treatment employed:

(1) Proper splinting of all fractures, combating of shock, thorough débridement of all wounds, burns, and compound fractures should be accomplished.

(2) A thorough physical and radiographic examination of all fractures with immediate reduction under general anesthetic must be made.

(3) Circular plaster casts should not be used. Suspension and traction, which is the ideal method for treatment of fractures, make possible close attention to the soft structures and neighboring joints.

(4) Active and passive motion, massage, diathermy, and contrast baths should be applied to all fractures. All splints should be removed as soon as possible.

(5) Open method should be used for treatment of burns, with débridement and exposure to the electric light, actinic ray, radiant light, in connection with Dakin's solution or boric acid or one-half of one per cent carbolic solution. Careful attention must be paid to the neighboring joints.

(6) Watchful attention must be given to all abdominal or back contusions—frequent physical examinations, frequent urinalysis, leukocyte count, red cell count, blood pressure, and detailed history of injury with an immediate exploration if these indicate positive findings.

—K. R. D.

PSYCHOLOGY OF INDUSTRIAL SURGERY. *H. W. Powers. Wis. Med. Jour., June, 1925, vol. 24, p. 17.*

INDUSTRIAL SURGERY. *R. Kaysen. Ibid., p. 21.*

INDUSTRIAL SURGEON. *E. W. Miller. Ibid., p. 25.*

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

BASAL METABOLISM. EXPERIMENTS IN THE BATH AND IN AIR. *Delcourt-Bernard and A. Mayer. Compt. rend. Soc. de biol., 1925, vol. 92, pp. 62–65.*

Indirect calorimetric experiments with human subjects show that the basal metabolic rate in air of 18°C. differs only slightly from that in a bath with a temperature of 36°C. Minimum metabolism was found to occur, however, not in the bath, but in the air after the bath. In air, the subjects wore ordinary spring clothing; they were nude in the water.

The authors conclude that the decrease in metabolism in a bath of 36°C. is not due to thermoregulation alone, since the minimum rate was obtained in air after the bath. This suggests that the bath increased the subjects' state of rest, and raises the question as to just when a person is "at rest" or at the basal condition.—C. P. Y.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

ELECTRIC CATARACT. *W. S. Franklin and F. C. Cordes. Jour. Am. Med. Assn., July 25, 1925, vol. 85, pp. 245–246.*

In dealing with electric burns about the face and eyes, the possible development of a cataract must be considered for a period of two years. In industrial cases, this possibility should be reported. The lenticular changes of an electric cataract are rather characteristic, the anterior cortex together with the deeper layers of the lens being involved. The opacities as a rule are flaky, although sometimes finely granular. The voltage causing electric cataract may vary from 220 to 50,000 volts. The eye nearest the site of the burn usually shows the most marked changes. Electric burns may cause serious changes in the globe without the production of a cataract.—K. R. D.

INDUSTRIAL ELECTRICITY. *G. S. Ram. Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 90–95.*

The development of the electric supply industry is reported to have been unusually active. Transmission pressures of 6,600 volts to 11,000 volts, which used to be considered high, are now common; there are a number at 33,000 volts and one at double that figure. Direct current is giving way to alternating. Electric driving is progressing in the textile industries, and the standard of illumination is being raised. Too little foresight and often carelessness is exhibited when laying down new plants. On the whole electric power is fairly under control, as indicated by only 433 accidents in the whole Kingdom, of which twenty-seven were fatal. A remarkable fact is that many persons who meet with severe shock at very high pressures survive, even though with permanent injuries; thus out of thirty-seven accidents on high pressure systems only six were fatal.—E. L. C.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

SANITATION. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 43–49.*

Advances are reported in heating and general ventilation particularly in cotton spinning mills where air is delivered through a conditioning plant without perceptible or unpleasant chilling effect, and is constantly in motion—a point of great physiologic importance. The efficiency and health giving properties are manifest in the faces and carriage of the workers who are in a better atmosphere than generally exists out-of-doors. Much has been done in sugar refining by lagging pipes and vessels containing hot liquor to keep rooms reasonably cool.

The dust problem in cotton card-rooms has been again engaging attention. This dust, which causes true spasmodic asthma, is removed by localized exhaust ventilation installed ten to fifteen years ago and the plants are becoming inefficient. Improved methods for dealing with the trouble are under consideration.

The subject of illumination is reported to be exciting greater interest; and steps have been taken to explain the underlying scientific principles to employers and workers in a large number of industries. The minimum standards recommended as practicable by the Departmental Committee on Factory Lighting are being found in many cases lower than what is advantageous; greater illumination gives greater efficiency and no limit has been found, while no injury to eyesight, if glare and shadows are avoided, ever occurs.—E. L. C.

Working of the Disinfection Scheme for Wool and Hair. *G. E. Duckering. Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 110–126.*

An account is given of the working of the government disinfection station at Liverpool where imported material is dealt with in bulk. All goat hair from India, and wool and animal hair from Egypt must be delivered at the station for disinfection. Apart from process difficulties, trade conditions have hampered success which, however, has finally been attained. The method of disinfection by formaldehyde has proved adequate, but the report is an interesting study of the difficulties which attend putting into commercial practice a scheme worked out on a scientific basis. Greater success, owing to trade reactions, has been obtained with goat hair than with wool. The total quantity of material disinfected up to the end of 1924 was 8,300,000 pounds, 600,000 pounds of which were sent voluntarily. The plant has needed improvement but now deals with 1,500 pounds an hour flowing through in a continuous stream; in the process the material is washed free from dirt, disinfected, and then dried. Much of the formaldehyde used is recovered to be used again and experiments are in hand for recovering more. Bacteriologic examination of 1,594 samples of raw material showed 140 to be infected with anthrax, while 1,648 samples of disinfected material gave only two positive results, one of which was at an early stage before the process was established and the other on retesting gave a negative result. The cost has steadily fallen, owing to improvements in machinery and efficiency in working and to a fall in the price of formaldehyde. The author holds that the trial stage of this great effort has now been successfully concluded and that the scheme has been proved practicable from a commercial point of view. The possibility of extending the scheme to include East Indian wool, Chinese and Mediterranean goat hair, and horsehair from Russia, China, and Siberia is discussed.—E. L. C.

Safety Lighting in Industry. *O. C. Holleran. Nation's Health, June, 1925, vol. 7, pp. 410–411.*

The author discusses the danger of explosions from unprotected lighting fixtures in such industrial plants as grain elevators, flour and seed mills,

dextrin and starch plants, spice mills, oil pumping stations, etc., and calls attention to the accidents and to the eyestrain resulting from the inadequate illumination from low power lamps which often exists in such establishments instead of safe efficient lighting from properly protected fixtures.—K. R. D.

TENTH REPORT OF ADVISORY COMMITTEE ON ATMOSPHERIC POLLUTION: REPORT ON OBSERVATIONS IN THE YEAR ENDING MARCH 31ST, 1924. *H. M. Stationery Office, 1925, pp. 53.*

This report is divided into eight sections, as follows:

Section 1.—Results Obtained by the Standard Gauge for the Collection of Deposited Matter.

Section 2.—Results Obtained with Automatic Filter.

Section 3.—Darkness of Wednesday, January 23rd, 1924.

Section 4.—The Jet Dust Counter.

Section 5.—Spectrographic Analysis of Suspended Impurities.

Section 6.—The Settlement Dust Counter.

Section 7.—Dust in the Upper Air.

Section 8.—Researches into the Effect of Atmospheric Pollution upon Visibility.

The standard gage of Section 1 has been described in previous reports of the Committee. In the Tenth Report, more detailed analyses and comparison of data are given from various stations in Great Britain. They show the variations in summer and winter of rainfall and of deposited matter under these heads: tar, carbonaceous matter other than tar, insoluble ash, soluble loss on ignition, soluble ash, total deposit, sulphates, chlorine, and ammonia.

In Section 2 an arbitrary division is made between days when there is much smoke haze, designated as "Z" days, and "ordinary" days when the smoke haze is not abnormally dense. More exactly, the former are days having a maximum of suspended matter above 1.28 mg. per cubic meter, or darker than Shade 4 on Owens' automatic filter; the latter are days in which the maximum of suspended matter is less than 1.28 mg. per cubic meter. From the numerous tables and charts in this section, the following conclusions are made:

There is definitely less smoke in the summer than in the winter as will be seen by comparing the summer curves with those for winter. This is doubtless due to the reduction in domestic smoke due to the warm weather.

A somewhat remarkable feature of all the Stoke curves for both summer and winter is the fact that in every case the Saturday forenoon maximum is the highest. This would be caused should there be a custom of lighting ovens on Friday night or Saturday morning, and on inquiry this was stated to be the case.

In Section 3 the course of an unusually thick haze is described in detail.

In Section 4 the method of using Owens' jet dust counter and microscopically examining the collected sample is given in full. The use of a double slot in the Owens' counter, as suggested in the Ninth Report of the Committee, has been found helpful in atmospheres where the number of particles is too great to permit counting when all the particles are collected on one single dust ribbon. The use of a by-pass to accomplish the same purpose is suggested.

Owens' settlement dust counter, a

new instrument, is described and illustrated in Section 6:

The instrument depends upon the principle of enclosing a definite volume of air to be tested in a small vessel with suitable precautions, the height of the vessel being known. The dust in a column of air of this height is allowed to settle upon the surface of a cover glass, where it is subsequently counted. Thus, the area of the base and the height of the column being known, the amount of dust per unit volume of air can be calculated.

To permit the measurement of bacteria, the instrument is of such design that it admits of being easily sterilised by heating.

The advantages of this method and apparatus are that (1) the deposit is obtained from a known volume of air, (2) the surface on which the deposit falls is exposed simultaneously with the admission of the air to the instrument, and (3) the air within the instrument is not in motion.

The investigations on dust in the upper air, described briefly in Section 7, were carried out by Dr. H. H. Kimball and Dr. Irving F. Hand of the United States Weather Bureau. They show that dustiness and the size of dust particles generally decrease with increase in altitude.

Section 8, on visibility, supplements the data given in the Ninth Report. The new data show that usually the relation between the light-obscuring power of a haze and the number or weight of particles per unit volume is linear. Visibility through a given haze or fog, or its light-obscuring power, can therefore be plotted against the number or weight of particles per unit volume, giving a line which is approximately straight.—P. D.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

First-Aid. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 83–89.*

Great advance has occurred owing to the new requirements of the Workmen's Compensation Act, 1923, which make provision of first aid obligatory in all factories. "Seldom, if ever, in the history of industrial legislation has a new requirement for the benefit of the workers been so readily accepted." The record of general interest and good will has been remarkable and gratifying. Boxes containing for the most part standard sterilized packet dressings and solution of iodine are the accepted up-to-date equipment; their success during the past ten years has been phenomenal; ancient applications, such as carron oil, are being discredited. At the same time training in first aid is extending, as well as the institution of ambulance rooms with expert staffs in charge. Everything points to the value of this development; for instance, out of 375 septic cases investigated, first aid had been used in only 216 cases. While whole-time works doctors are rare, fully trained nurses are fairly numerous; nevertheless medical supervision is extending.—E. L. C.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

Employment and Welfare. *Ann. Rep. Chief Inspect. Factories for 1924. H. M. Stationery Office, 1925, pp. 49–61.*

The scheme under which women and

young persons may be employed in two day shifts of eight hours each, permitted by Act since 1920, is reported on. The period covered has been one of trade depression and therefore unfavorable for any extensive use of the permission. So far as experience has been gained, no administrative difficulties have been encountered. The plan allows machinery to run sixteen hours out of the twenty-four; the total of persons employed in the four years in this way has only amounted to about 23,000, so that the usefulness of the plan which has economic advantages has not been widely tried. In some cases the workers have preferred the scheme to ordinary hours, and no evidence, medical or general, has come to light that it has any injurious effect on health. The system has only been allowed where welfare conditions have been up to standard.

For the most part hours of work have generally been forty-eight a week, and few instances of excessive hours are reported. Certainly they are unnecessary with unemployment so widespread. Progress has been made in welfare conditions called for by statute, particularly in herring curing at Yarmouth and Lowestoft. Well-staffed first-aid stations are now provided and are particularly required for the Scotch girls imported for the fishing season.

More steady advance is reported in voluntary welfare schemes which have come to stay. The movement is helping to humanize industry. Recreation, education, rest rooms, savings, canteens, bathrooms are all receiving attention; in some cases dental clinics have advantageously been established. Vocational selection is getting a footing, and medical supervision is here and there being adopted. These beginnings at a time of industrial depression are notable.—E. L. C.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

COMPENSATION FOR INDUSTRIAL ACCIDENTS: COMPARATIVE ANALYSIS OF NATIONAL LAWS. *Internat. Labour Office, 1925, pp. 655.*

This volume is one of the technical reports prepared in view of the 1925 Session of the International Labour Conference. It contains a description of the whole workmen's compensation legislation existing at the end of 1924 (over forty countries) except that of the United States and Mexico, which is treated in a separate volume.

The study is divided into six parts, corresponding to the principal features of every workmen's compensation law, namely: scope, risks covered, compensation, guarantees, procedure and settlement of disputes, and position of foreigners. The provisions of the different laws are then compared and classified, feature by feature. A series of tables and summaries shows in schematic form for each country the legal provisions concerning each feature. In an appendix is given a list of the several hundred laws utilized in the preparation of the study.

SUBJECT INDEX TO VOLUME VII

This is a subject index to all the reading matter in the ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE, and one should, therefore, look for the subject word. The name of the author follows the subject entry in parentheses.

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